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International Marine Engineering

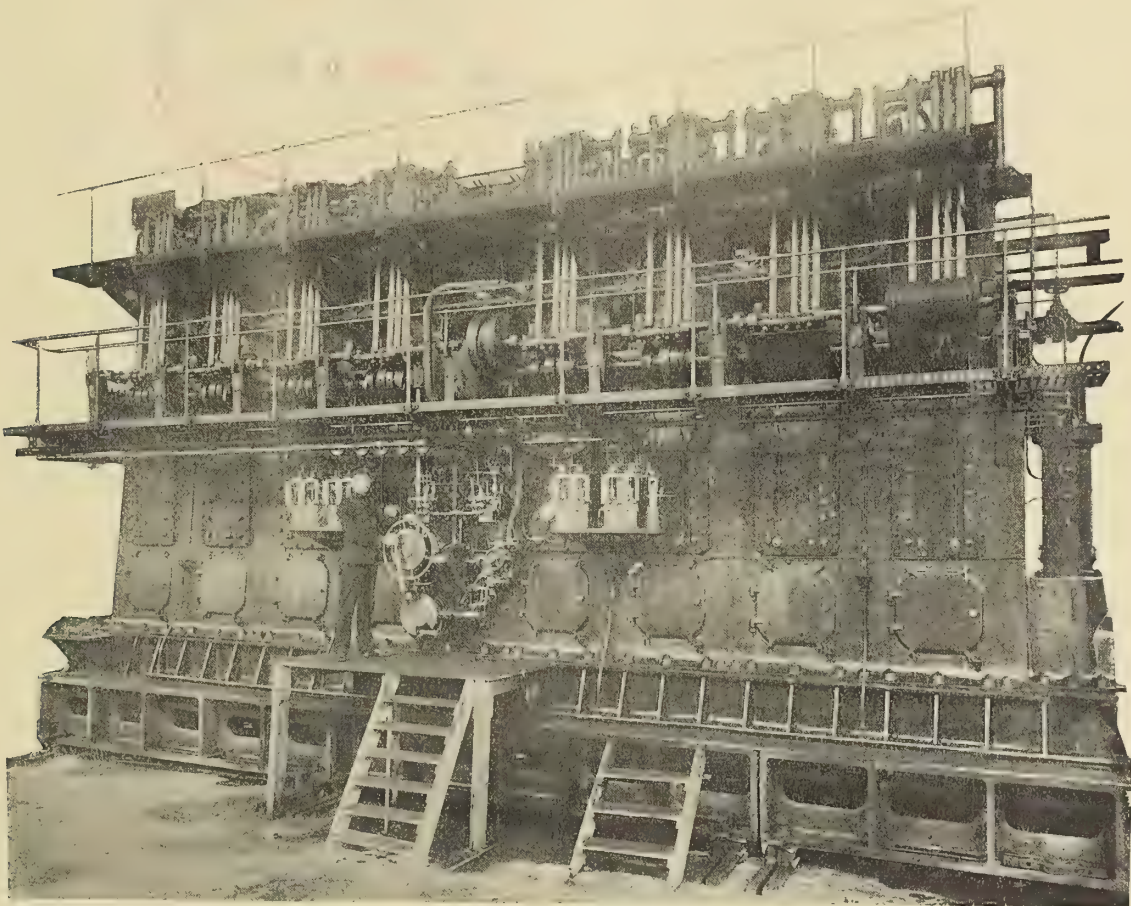
APRIL, 1912

Success of the First Large Diesel Motor-Driven Liner

BY J. RENDELL WILSON

With the trials of *Selandia* (see INTERNATIONAL MARINE ENGINEERING, March, 1912) the future of the big motor ship is practically assured; in fact, immediately following the official acceptance tests, Burmeister & Wain, Copenhagen, her builders, were, I understand, inundated with orders for similar vessels from steamship owners who were aboard, and now have enough marine oil engine contracts on hand to keep them busy for about three years. Credit is due to Burmeister &

adverse conditions, having to run through ice, yet a speed of 13.35 knots was attained when running light, although with 950 tons of fuel and fresh water on board. Her loaded designed speed is 11 knots. She is one of the three combined liner and cargo sister ships for the East Asiatic Company, of Copenhagen, having accommodation for fourteen passengers, and will be used for service between Europe and Siam. *Fionia* and *Jutlandia* are her two sisters, and by the



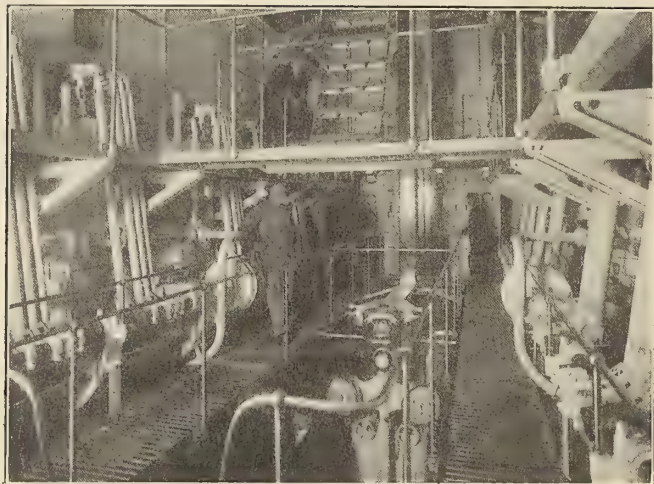
ONE OF THE EIGHT-CYLINDER, 1,250-BRAKE-HORSEPOWER DIESEL ENGINES OF THE SELANDIA

Wain, not only for having successfully built the largest full-powered Diesel ship afloat, but for having constructed the machinery, which aggregates 2,500 brake-horsepower (3,000 indicated horsepower), apart from two auxiliary engines each of 200 brake-horsepower, in a remarkably short time. How great a stride has been made may be judged from the fact that the largest of the Russian motor vessels, the *Karl Hagen*, has engines installed aggregating only 1,200 horsepower.

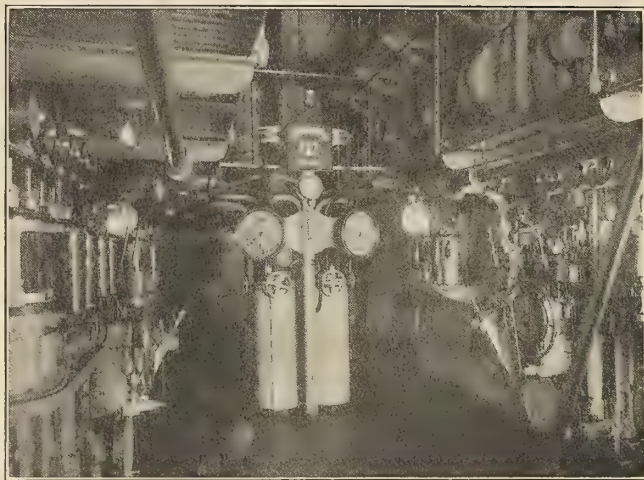
Selandia's trials were carried out at Copenhagen under

time these lines appear in print will doubtless have passed their trials. The first named is also being built and engined by Burmeister & Wain, while *Jutlandia* is being constructed and engined on the Clyde by Messrs. Barclay, Curle & Company, Whiteinch, Glasgow, under license. Bigger motor ships there are, of course, building, but the jump in size and power will have no comparison with that of *Selandia* and existing vessels of her type.

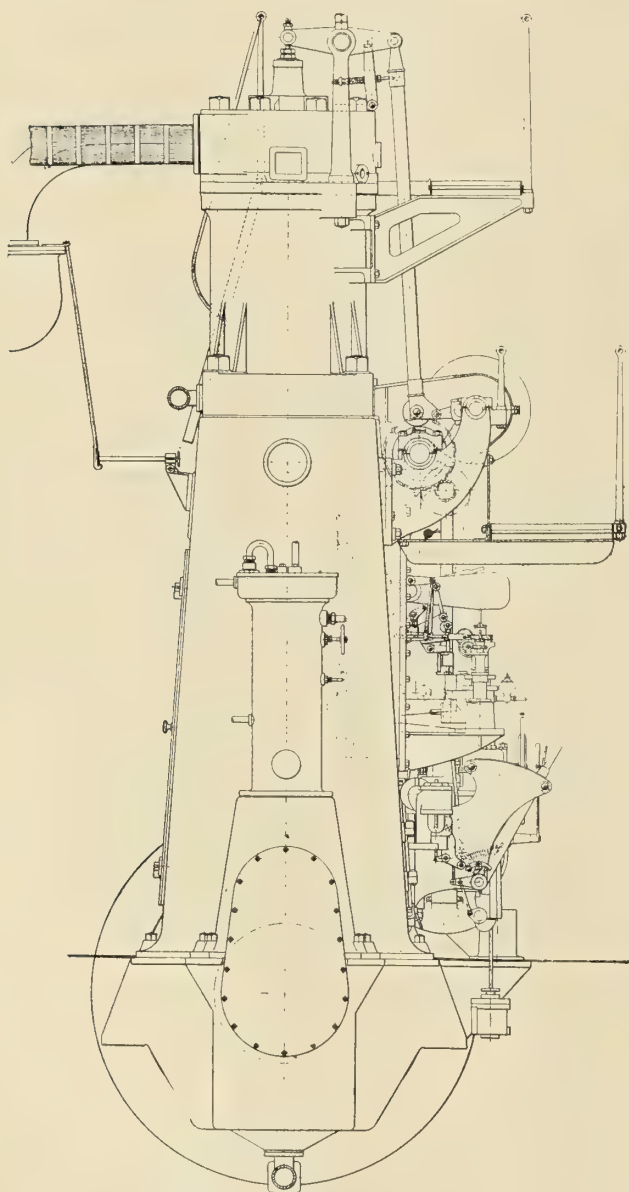
One of the greatest surprises to engineers and steamship



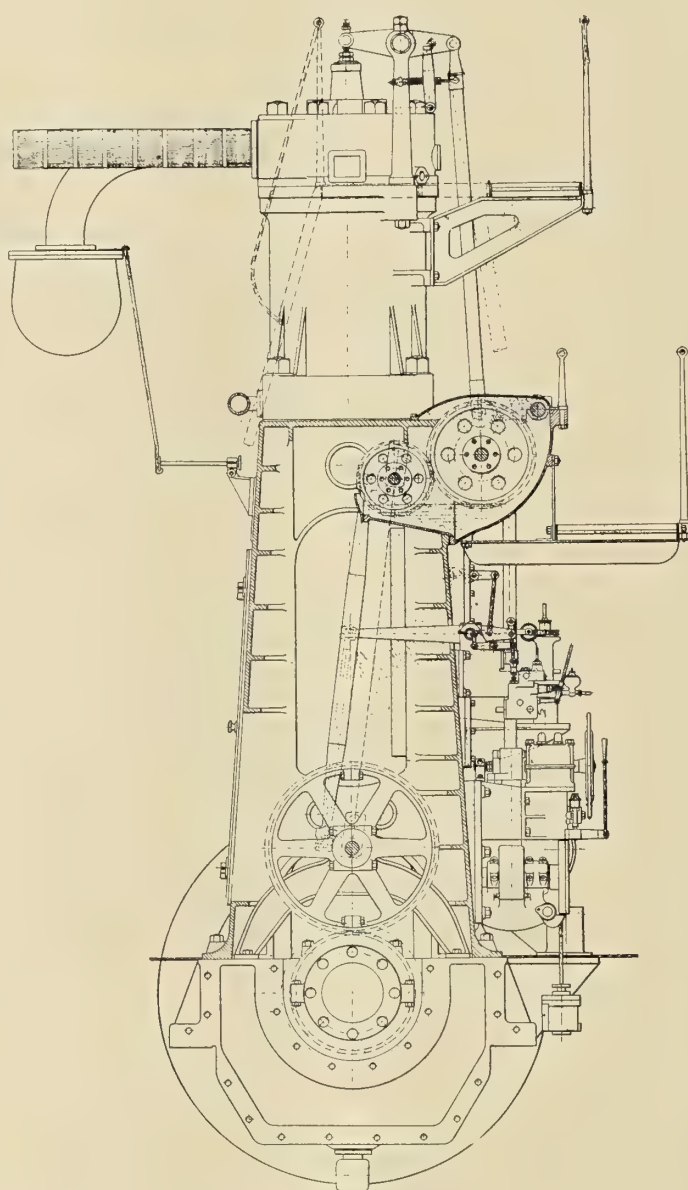
UPPER PLATFORM IN THE ENGINE ROOM



ENGINE ROOM OF SELANDIA, SHOWING CONTROLS



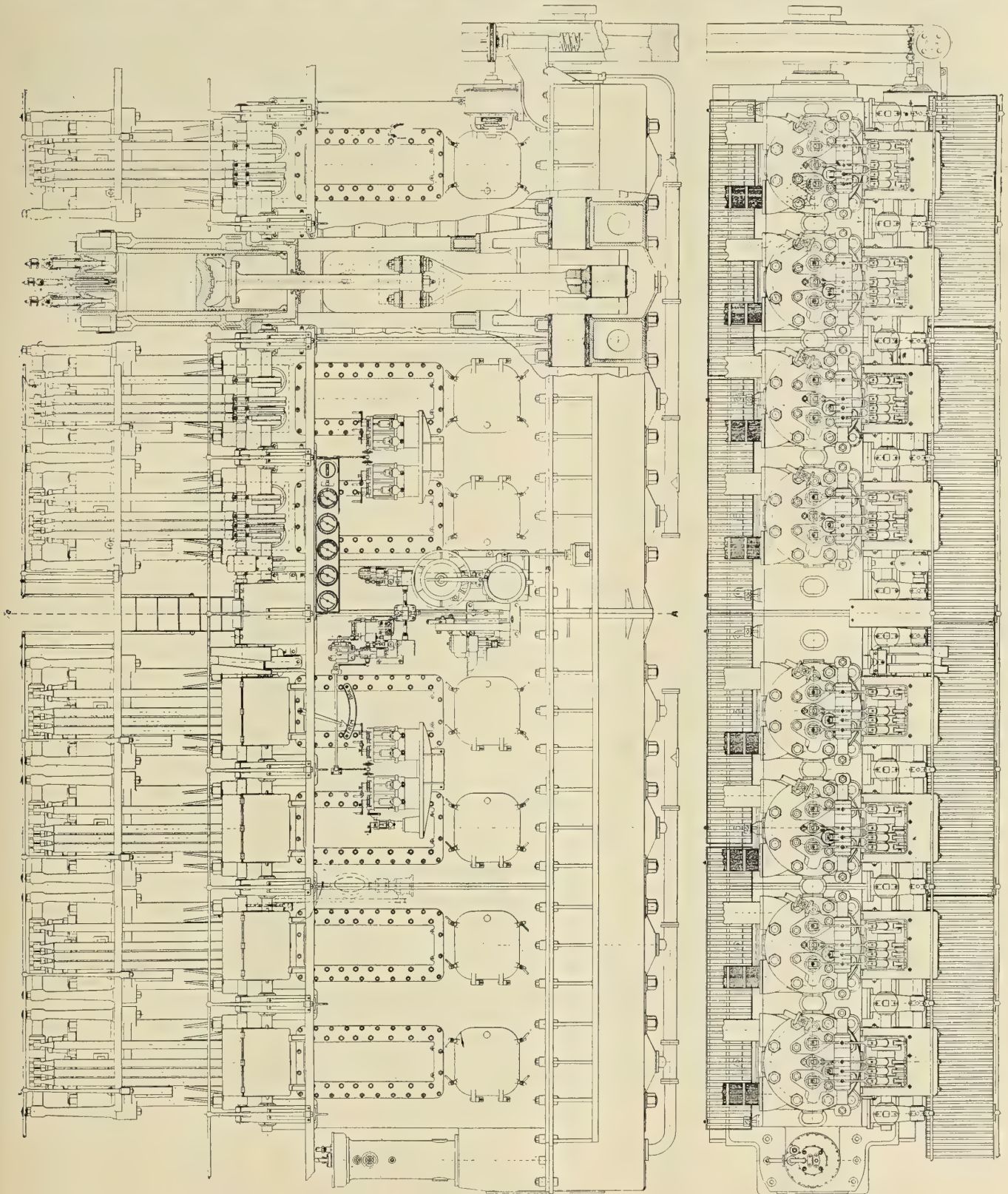
FRONT VIEW OF STARBOARD ENGINE



SECTION OF ENGINE THROUGH A-B

owners present at the trials was that, in addition to the Diesel engines proving perfectly reliable, there was a complete absence of vibration and noise; in fact, it was agreed that her machinery ran more quietly and sweeter than steam engines.

direction of rotation from "full ahead to full astern." In addition to these three vessels the East Asiatic Company have placed orders with Messrs. Burmeister & Wain for eight more motor ships—two of 10,000 tons and six of 6,000 tons, so the



PLAN AND ELEVATION OF 1,250-HORSEPOWER ENGINE FOR THE SELANDIA

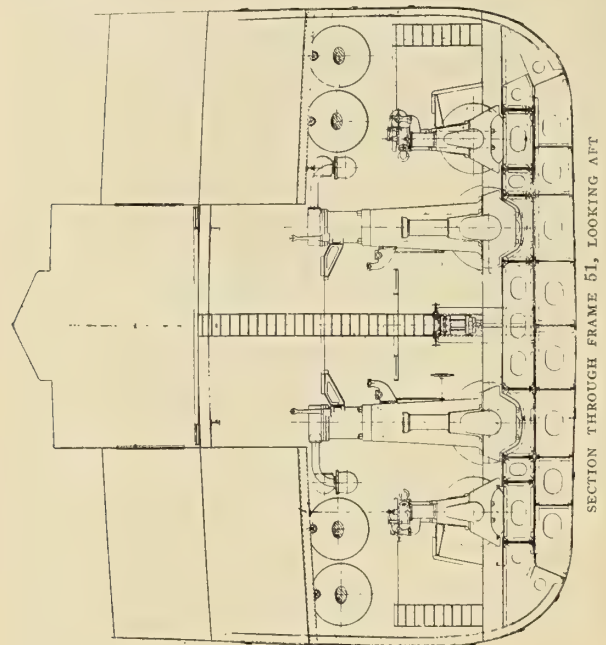
When they have been in service for a while, doubtless the running will leave nothing to be desired. Except when starting or reversing the exhaust is quite colorless. On her private trials a week previous she almost collided with the steamer *Skandia*, but was saved through the prompt reversing of her engines. Only 15 to 20 seconds is necessary to change the

company will soon have a fleet of eleven Diesel vessels aggregating 85,000 tons.

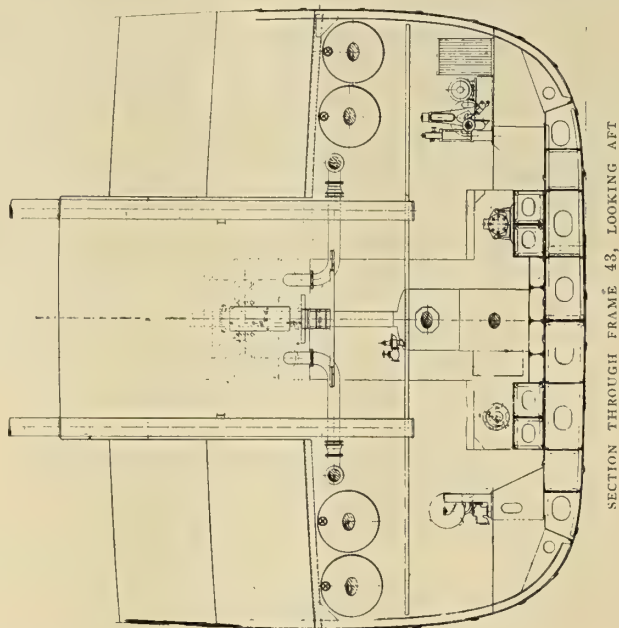
Selandia is 386 feet in length over all, 370 feet between perpendiculars by 53 feet beam, with a molded depth of 30 feet and 22 feet 6 inches loaded draft. Her fully loaded displacement is 9,800 tons, and her deadweight capacity 7,400

tons. The gross tonnage is 4,900 and the net register 3,200 tons. A vast amount of space usually given over to bunkers is saved and given over to the cargo. In fact, her double bottom forms the main fuel tank, and has a capacity of 900 tons of oil, which is sufficient to keep her main engines going for a voyage of 20,000 miles under average conditions. Let us imagine the amount of coal that a steamer of the same

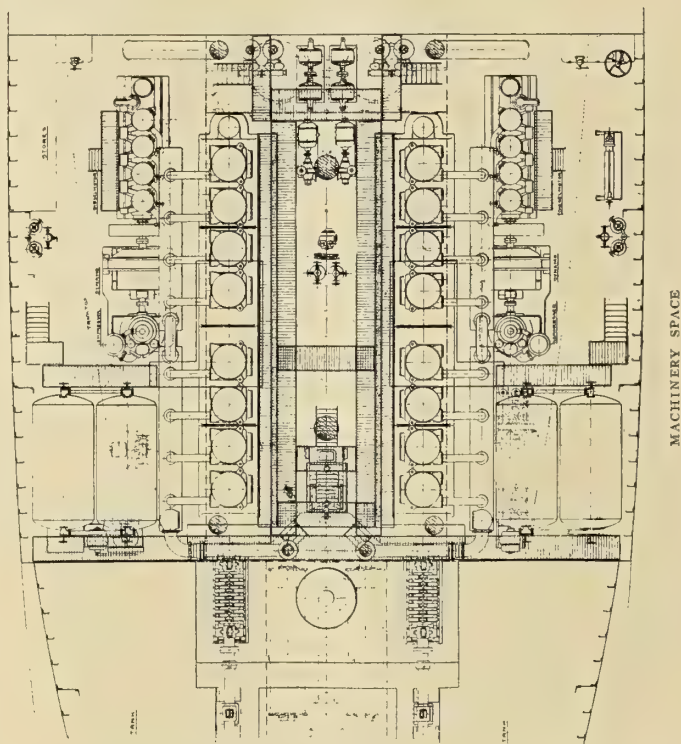
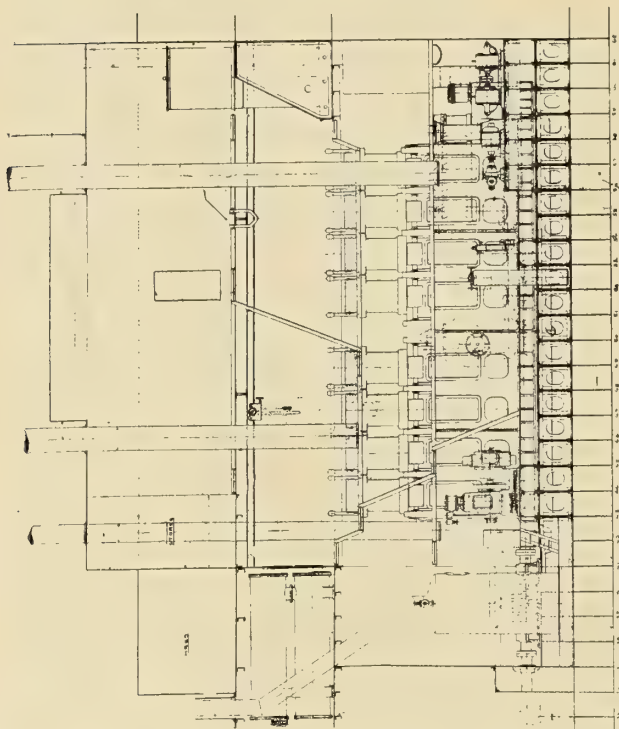
cycle, single-acting type, each cylinder has a bore and stroke of $20\frac{7}{8}$ inches and $28\frac{3}{4}$ inches, respectively. With both engines the cylinders are divided into groups of four, the mechanism for controlling and operating the valve gear being between each group. Each set of four cylinders has the cranks set at 180 degrees, and as the two halves are arranged at 90 degrees to each other, perfect running is obtained, which ac-



SECTION THROUGH FRAME 51, LOOKING AFT



SECTION THROUGH FRAME 43, LOOKING AFT



MACHINERY SPACE

deadweight capacity (7,400 tons) would require for a similar cruise. At least 4,500 tons would be necessary, and probably even more.

She is a twin-screw vessel, and her main propelling plant consists of two eight-cylinder Burmeister & Wain Diesel engines, each developing 1,250 brake-horsepower (1,500 indicated horsepower) at 140 revolutions per minute; but on the test-bed no difficulty was found in obtaining an additional 150 brake-horsepower at slightly higher revolutions. Of the four-

counts for the absolute lack of vibration. Another feature towards smooth running is the fitting of four-bladed propellers. The cylinders are mounted on a heavy casing, and are bolted through to very massive engine beds. There are four valves to each cylinder, namely, the air-starting valve, the inlet valve, fuel injection valve and the exhaust valve. All are operated off one main cam-shaft on the front of the engine by means of vertical rods, that in turn actuate the rocker arms on the cylinder head, the rocking movement of



DINING SALOON



DRAWING ROOM

the latter opening and closing the valves, as the case may be. Just over the main cam-shaft, and running parallel with it, there is a lay-shaft, which lifts the vertical valve-operating rods clear of the cam-shaft for starting or reversing the engine. How the lay-shaft lifts the valve rods may be made clear in a few words: The lower end of each rod is boot-shaped, the heel carrying the tappet roller, while the toe is connected to a short connecting rod from a crank on the lay-shaft, and so by turning the lay-shaft a half circle the valve rod rollers are lifted clear of the cams, thus throwing all the

a drum, in the periphery of which is cut a diagonal slot, while in the latter runs a disk secured to the cam-shaft. Thus as the lay-shaft is given the half-turn, so the cam-shaft slides on its bearings.

There is only one single-stage compressor actually forming part of each engine, and this is driven off the forward end of the crankshaft, the three-stage compressors being driven by two auxiliary engines of 200 brake-horsepower. The compressor of each main engine takes the air at 300 pounds per square inch, and compresses the same to 900 pounds per square



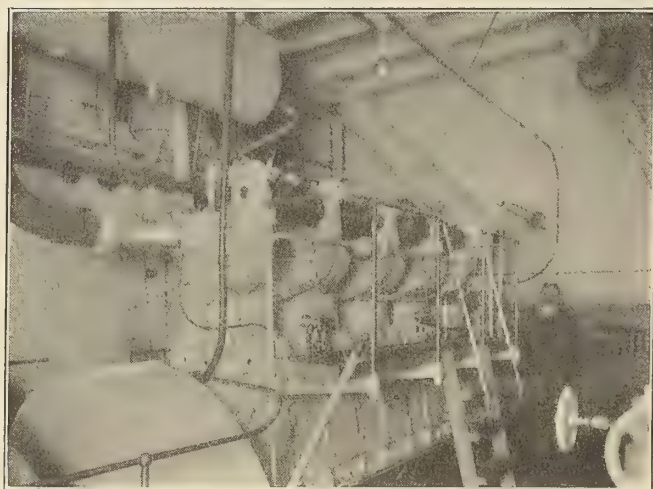
MOTOR SHIP SELANDIA

valves temporarily out of action. The cam-shaft can then easily be moved into the ahead or astern position. To operate the lay-shaft there is a very small two-cylinder compressed air engine, which is controlled by a single lever. Should, however, this little engine fail, the lay-shaft can be operated by the large hand-wheel shown in the illustration. The lay-shaft also slides the cam-shaft fore and aft for the reverse and ahead positions. Sliding the cam-shaft brings another set of cams into action. In the center of the lay-shaft can be seen

inch, then supplying it to storage bottles. This air is used for fuel injection. For each set of four cylinders there is a separate fuel pump, which delivers the fuel to a distributing box or valve, mounted on the back of each set of cylinders, thence the oil passes to the injection valve of each cylinder. The fuel distributors all have hand regulators, so that the fuel supply can easily be controlled, while there is a hand-pump for priming the fuel pipes when starting. Should the propellers suddenly lift from the water racing is prevented by an

Aspinall's governor, which shuts off the fuel supply if the engine exceeds 140 revolutions per minute, allowing, of course, the fuel to again come into operation immediately the engine speed drops to normal.

Regarding the auxiliary machinery, there are two four-cylinder Diesel engines of 200 brake-horsepower apiece, each of which drives a 220-volt dynamo, and a three-stage compressor. Under ordinary conditions only one auxiliary set is kept running, the other being a duplicate, and for use when in harbor to supply the necessary current for operating eight electrical deck winches. The three-stage compressor of each set delivers air at 300 pounds per square inch to two large storage bottles, which contain enough air to start the main engines about fifteen times. These 200-horsepower auxiliary sets are quite self-contained, and have their own two-stage



ONE OF SELANDIA'S 200-BRAKE-HORSEPOWER AUXILIARY ENGINES

compressors and storage bottles, so the main compressors (and their storage tanks), which, although driven by the auxiliaries, are not interfered with.

The only steam unit aboard the ship is a three-stage compressor set for use in case of emergency, and even the donkey boiler of this is oil-fired. Air from this set is delivered at 900 pounds per square inch. All the other auxiliaries, such as water pumps, are operated by electricity with the exception of the fuel and bilge pumps, which are driven by an air engine. There are no funnels to the ship, but the exhaust is led up through the hollow mizzen mast, the outlet being about 25 feet above the deck. Although *Selandia's* machinery is estimated to have cost some \$50,000 (£10,300) more than that of a steam-engined vessel, her owners expect to gain \$40,000 (£8,220) per annum. The reason for this is that no less than \$25,000 (£5,140) a year will be saved on the fuel bill alone, while compared with a steamship of the same tonnage she can carry 1,000 tons of cargo more. This, it is stated, will mean \$15,000 (£3,080) extra freight receipts. The statement that the motor ship *Selandia* means a total saving of \$50,000 (£10,300) per annum will doubtless be dubiously received in many quarters, but this figure the East Asiatic Company considers a very reserved one, as it is not based on full cargoes or passenger receipts for every voyage. Their confidence in *Selandia* has, as before stated, led them to placing orders for altogether eleven motor ships aggregating 85,000 tons.

In connection with the successful trials of the *Selandia*, it is interesting to note the thirty-day non-stop test of one cylinder of a similar engine building by Barclay, Curly & Company, Ltd., for one of her sister ships. During this trial the maximum horsepower developed by the single cylinder was 126 at 143 revolutions per minute. The fuel consumption figured out as .45 pound per brake-horsepower.

Performance of the Archer

Equipped with the first marine producer gas installation on the Pacific Coast, the barkentine *Archer*, 900 tons net, is again in service between Puget Sound and San Francisco engaged in freighting lime in barrels from the quarries and kilns of her owners, the Tacoma & Roche Harbor Lime Company, at Roche Harbor, Wash., to the California ports. While the owners of the vessel have as yet made no official statement giving an idea of how the gas plant is working, some figures have been gleaned indicating that the *Archer's* engines are saving the owners much money, not only in the matter of general expense, but also in time.

When operating under sail, the *Archer* required on an average five weeks to make the round trip between the quarries and San Francisco and return, including time of loading and discharging. Frequently the time was considerably lengthened, especially in the winter, when the vessel was delayed by stormy weather; or in the summer, when calms and head winds resulted in protracted passages. However, with the gas engine plant, the barkentine has practically cut her former time in two, thus doubling her value to her owners, as she will be able to make twice the number of voyages as formerly, and in addition is saving nearly \$6,000 (£1,230) per year in towage charges.

The distance from Roche Harbor to San Francisco is practically 850 miles, while the distance from Tatoosh Island, where vessels pass out to sea, is approximately 100 miles less. A resumé of the *Archer's* time since she began operating under power will be of interest.

The *Archer* has made the distance to San Francisco in approximately $4\frac{1}{3}$, $3\frac{1}{2}$, 4 and $4\frac{1}{2}$ days, respectively, while northbound she has been approximately $5\frac{1}{3}$, $6\frac{1}{2}$ and $4\frac{1}{3}$ days en route. Naturally her time has varied with the condition of the weather, but her average will compare favorably with the slower steam tramps operating on this coast. It is considerably less than one-half the time the vessel formerly required when under sail only.

As an illustration of the workings of the producer gas engine in this installation, the data of the voyage leaving San Francisco for Roche Harbor, Nov. 1, is of interest. This was the vessel's slowest run northbound under power, it requiring 152 hours from San Francisco to Roche Harbor, or from 2 P. M., Nov. 1, to 10 P. M., Nov. 7. During this run the *Archer* encountered some severe weather. On this passage the engine was operated 148 hours, during which 425 hoppers of coal were used, each hopper containing 175 pounds. The engine's average was 180 revolutions per minute. With coal at \$2 (8s.) per ton, the cost for the passage was but \$74.35 (£15.3). The figures show a consumption of 1.67 pounds of fuel per horsepower hour. With the 300-horsepower engine operating at 180 revolutions per minute, the approximate cost was \$.502 (2s.) per hour. This is considered a very fair showing and is highly pleasing to the company which made the installation.

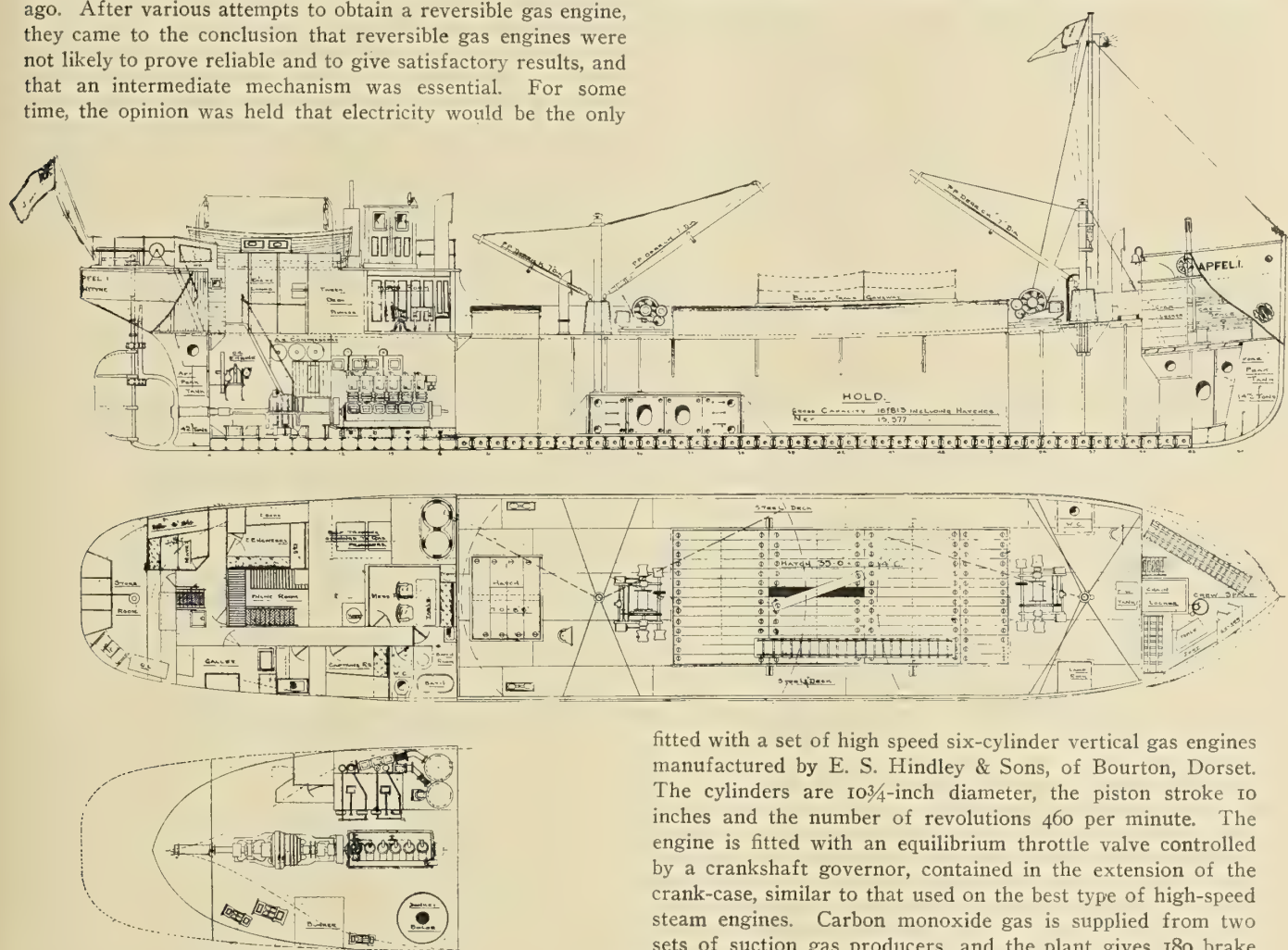
The installation was described in detail in the June, 1911, issue of INTERNATIONAL MARINE ENGINEERING. It will be recalled that the vessel is approximately 900 tons, 180 feet in length, 32 feet beam. The main engine is a 300-horsepower Nash engine built by the National Meter Company, New York. It is of the four-cylinder type, with cylinders 18 by 18 inches, operating at a speed of 200 revolutions per minute. The weight of the engine is 8,050 pounds, and a 500-horsepower Akron friction clutch is mounted directly upon the transmission end of the engine shaft, which is connected to the thrust shaft. The propeller, built by L. H. Coolidge, which is described elsewhere in this issue, is 82 inches in diameter by 82 inches pitch. The producer was designed and built by the Schmidt Gas Power Company, and is of 400 horsepower capacity. It is 9 feet in diameter and 10 feet in height.

Sea-Going Producer Gas-Driven Cargo Vessel Holzapfel I

BY F. C. COLEMAN

The power gas plant at the works of Holzapfels, Ltd., of Felling-on-Tyne, has worked very satisfactorily for six years, producing gas power at the cost of $\frac{3}{4}$ pound of bituminous coal per indicated horsepower per hour, and this fact convinced the proprietors of the composition firm of the great economical future of gas power in connection with its adaptation to marine purposes. Accordingly, the Holzapfel Marine Gas Power Syndicate, Ltd., with Messrs. A. C. and M. Holzapfel as directors and Messrs. H. A. B. Cole and T. W. Cherry as consulting engineers, was formed some few months ago. After various attempts to obtain a reversible gas engine, they came to the conclusion that reversible gas engines were not likely to prove reliable and to give satisfactory results, and that an intermediate mechanism was essential. For some time, the opinion was held that electricity would be the only

inches molded depth and has a deadweight carrying capacity of 350 tons. The most interesting feature is the machinery equipment and, therefore, it is not necessary to enter into any detailed description of the hull of the vessel. It will be seen that for the purposes of trim it has been necessary to construct a deep ballast tank amidships and to have two hatches instead of one, as is usual in vessels of this size, and that, in order to conform to existing conditions, the engines and gas plant are placed aft, occupying about the same space as boilers and compound engines of similar class. *Holzapfel I* has been



PLANS OF HOLZAPFEL I

means of attaining this purpose, and accordingly extensive negotiations were conducted with a view to building an experimental vessel and using electricity for reversing, maneuvering and slow speeds. It was not, however, until Professor Föttinger, of Stettin, Germany, perfected his invention of the hydraulic power transformer that Holzapfels realized its suitability for internal combustion engines and secured from the Vulcan Company, of Stettin, the British patent rights so far as gas engines are concerned. Shortly afterwards, a contract was placed with Messrs. J. T. Eltringham & Co., of South Shields, for the construction of a small experimental boat, *Holzapfel I*, which takes rank as the first sea-going gas-driven cargo vessel afloat.

Holzapfel I is 120 feet in length, 92 feet beam, 11 feet 6

feet fitted with a set of high speed six-cylinder vertical gas engines manufactured by E. S. Hindley & Sons, of Bourton, Dorset. The cylinders are 10 $\frac{3}{4}$ -inch diameter, the piston stroke 10 inches and the number of revolutions 460 per minute. The engine is fitted with an equilibrium throttle valve controlled by a crankshaft governor, contained in the extension of the crank-case, similar to that used on the best type of high-speed steam engines. Carbon monoxide gas is supplied from two sets of suction gas producers, and the plant gives 180 brake horsepower as a maximum, the continuous working load being 156 brake horsepower. The engine is fitted with low-tension magneto ignition on Hindley's system, which ensures the correct synchronizing of the revolutions of the armature of the magneto machine in relation to the opening of the spark gap in the cylinder. The actuating gear is of a very simple type. The plugs are operated by vertical rods and six cams and levers similar to the valve motion employed on vertical engines. The magneto machine is driven from the end of the cam shaft and supported on a bracket which oscillates by means of the timing gear around the center of the cam shaft. The combined high and low tension distributor is on the extreme fore end of the cam shaft. Two "Lodge" igniters, one for supplying the current for three of the cylinders, and the other for the remaining three cylinders, are fitted.

All the handles for controlling the engine are situated on

the fore end, so that the engine is easily managed by one attendant. The gas and air regulators are constructed in such a way as to avoid the possibility of sticking in the event of the regulator remaining for long periods in one position. Both these regulators have screw adjustments with an indicator which shows the amount of opening of the regulator, in the same way as a micrometer scale indicates its measurements. There are circulating indicating drums which are marked "Air Regulator" and "Gas Regulator." The readings on these drums show the opening from zero to 100 degrees, so that the ratio from air to gas can be readily seen and the exact position for starting and working under various speeds and conditions can be accurately recorded.

The valve gear is of the ordinary type, now almost universally used in vertical engines—that is to say, the inlet valve operated by rocking lever from the cam and cam lever in the crank-case. The exhaust valve is lifted direct from the cam by means of a roller and lever. There are valve lifters fitted to each exhaust valve by means of which the exhaust valve can be raised on each cylinder apart from the cam so that the engine can be turned round with the greatest ease.

The three fore cylinders are fitted with compressed-air apparatus for starting, and this is also constructed according to Hindley's patented system, and by means of which it is possible to gain access from the compressed-air apparatus to the gas plant. The compressed air is supplied by a separate engine, of quite a small size, and working on petroleum. The compressor is direct coupled to the side of the engine.

The engine has forced lubrication by a valveless pump which is situated at the aft end, in which position there will always be a supply of oil even if the boat is light and she should trim a little by the stern. The cylinders are cooled by sea water supplied by a centrifugal pump driven from the crankshaft by means of bevel gearing which is enclosed in the crank-case, only one end of the shaft projecting through the casing. The pump, which is quite accessible, is of the well-known "Invincible" type, made by Gwynnes, of Hammersmith, London. The spindle, packing gland, and propeller are of bronze. The pump draws the water from the sea-cock and forces it into the circulating manifold on the bottom of the cylinders, from which it circulates through each cylinder and cover separately and then discharges through the ship's side.

The cylinders are of the makers' patented design, which is expanding, but jointless, and extra large water spaces are provided in view of cooling by salt water. In the cylinder of an internal combustion engine, as is well known, water cooling is necessary to keep down the temperature of the wall to the highest point at which no harmful results follow. A water-jacket surrounding the working cylinder is, therefore, a necessity. In vertical gas engines it is an advantage to cast the cylinder and jacket in one piece. To do this in such a manner as to avoid risk of initial strains being set up in the metal due to unequal cooling of the two walls after casting, provision must be made to allow the outer water-jacket wall to expand or contract according to the behavior of the inner wall. This Hindley & Sons have effected by a patented arrangement of corrugation in the water-jacket wall. During the cooling of the casting after founding, should the inner wall contract more slowly than the outer, the corrugations open out, or, vice-versa, they contract.

The exhaust pipe, which is made in seven sections, each of which is water-cooled, greatly facilitates access to the sparking plugs and generally conduces to the comfort of the engine attendants. A small flywheel to the engine at the aft end, which is provided with half-coupling to connect to the Föttinger transformer, and the aft end of the engine frame is constructed with facings for bolting to the framing of the transformer. A small pulley is supplied on the fore end of

the engine for driving the auxiliary pumps and a small dynamo and switchboard are provided for charging the batteries for the "Lodge" ignition gear.

The gas plant portion of the equipment of the ship consists of two units each capable of developing 100 horsepower as the normal working load, and comprising two generators and two coke-washers and scrubbers, combined. The generator is rectangular in section and plan, with suitable refractory brickwork of similar form with rounded corners, and of such thickness as to prevent undue loss of heat from radiation. An annular jacket is constructed round three sides of the generator, the object being to superheat the air during its passage to the fire, and thus advantageously utilize the heat radiating from the firebrick lining. In the lower portion of the generator is fitted a special triangulated grate with a suitable door at the front of the vessel to admit of ashing and ready withdrawal of the grate whenever necessary. To each side of the center of the grate is fitted an air-tight door for clinking and ashing purposes. The whole generator can be thoroughly searched from these doors, and the clinking and ashing operations conducted while the plant is on load. Air supply is admitted to the superheated jacket at the front of the generator and may be regulated by means of a simple horizontal screw-down valve.

For initial starting purposes a small steam jet blower is fitted to the center door; immediately the engine is up to speed this blower is put out of action and the supply of steam for gas-making is then fully maintained from the self-vaporizer fitted to the upper portion of the generator. Each vaporizer consists of four rectangular solid-welded tubes, reaching from back to front of the generator, so arranged that the hot gases pass over their whole surface, thus utilizing a substantial portion of the heat in the gas. The vaporizers are secured to a cast-iron sleeve at the front of the generators and a joint made with sal ammoniac and borings, an absolutely gas-tight joint being thereby effected, notwithstanding the high-pressure of the gas. This arrangement admits of easy removal of any of these tubes in case of inspection or renewals. In the case of *Holzappel I*, fresh water is used for vaporizing purposes, but the plant can easily be adapted to utilize sea water by means of a simple device patented by Mr. A. C. Holzappel, the managing director of the Holzappel Marine Gas Power Syndicate, Ltd.

The brick lining is of substantial thickness, the blocks keying from one to another so that the movements of the ship, however severe, will not disturb the stability of the lining.

The front of each generator forms a part of a gas-tight bulkhead entirely separating the gas producer plant from the engine room, and all the operations in the working of the plant are carried out from the latter room, including stoking, poking and ashing. The stoking device consists of a specially designed hopper and rotary hollow-plug valve, the plug having a port on one side only, so arranged that it is impossible to admit air into the generator during stoking operations. Above the plug is fitted a tapered hopper, communicating directly with the fuel bunkers overhead. For a simple half-turn of this plug, the fuel feeds itself into the generator, having previously fallen into the hopper by gravity from the bunker above. Trimming of the fuel in the bunker or the hopper is, of course, entirely unnecessary. The whole details of the plant have been designed with a view to economy in labor, and absolute safety and assurance in working, in addition to considerations of space occupied, on all of which points it is claimed that substantial advantages have been demonstrated by the operations of *Holzappel I* as compared with steam practice. On the gas outlet pipe from the generators are provided dust boxes which effectually prevent the choking up of the pipes with dust. As an earnest of the efficiency of this arrangement, it was found that after several months' con-

tinuous use practically no dust remained between the generator, scrubber or pipes. The dust boxes are, of course, periodically cleaned out when the ship is in port.

The coke washer is a cylindrical vessel, built up of steel plates, strongly riveted together. The gas is introduced near the bottom of the vessel, which is filled with suitable sized hard coke, carried upon steel perforated plates; cleaning doors of ample size are provided, these affording facilities for the ready removal and refilling of the coke when required, but this latter operation is, however, seldom necessary, and the washers, therefore, require little attention. The upper part of the washer forms a separate compartment containing an adequate depth of wood wool, the function of this part of the cleaning plant being to arrest the moisture and final traces of dust in the gas before passing to the engine. Immediately under the bottom plate of this gas-drying chamber a spray pipe distributes sea water over the whole surface of the coke filling, the water being pumped from a gravity-fed sump in the ship's bottom. This has proved a very efficient means of cooling the gas down to atmospheric temperature. The waste water from the washer drains itself through a special arrangement consisting of an inverted cone which restricts the amount of water in motion due to the roll of the ship. A lute is provided and a drain pipe fitted, so that the water inside the scrubber never rises above a certain level and becomes objectionable. The lute lies over and dips into a funnel lead to a waste sump at the bottom of the ship, from which the washer effluent is pumped overboard. The engineer-in-charge has thus visible means of observing that the flow and levels of the water are correct and according to the passing requirements. Centrifugal pumps, belt-driven from the engine, are employed to raise the wash water and to discharge the waste. It is an essential feature of the plant that the water from the coke scrubber should be prevented from escaping into the engine room, and, more important still, the level in the lute pump must be kept at all times within working limits. The bunker, of 12-ton capacity, is situated in the 'tween decks. The hull, engines and gas plant have the highest class at Lloyds.

Since the trials of *Holzappel I* comparatively little information concerning the ship's movements and performances has been available. This arose from the fact that at the inaugural voyage last summer the vessel met with a collision in the Tyne, and various delays arose from the newness of the machinery on board and from the lack of machinery. Various adjustments of the machinery had also to be made before the vessel was able to do regular and satisfactory work. The vessel has now carried the following cargoes:

The Tyne to London.....	242 tons coke.
London to Llanelly.....	330 " scrap iron.
Llanelly to London.....	330 " lime.
London to Cork	330 " hardwood and cement.
Cork to Newhaven.....	251 " oats.
Guernsey to London.....	340 " granite.
London to the Tyne.....	340 " chalk.
Seaham Harbor to Morlaix...	331 " coal, and
Guernsey to Weymouth.....	330 " granite.

These voyages were performed in a satisfactory manner and the consumption of fuel is stated to have varied from 25 to 33 hundredweight of coal per 24 hours and, as this is less than one-half the fuel consumption of that of a steam-driven vessel of the same size, and the labor and attendance are also considerably less, there is a considerable economy from these sources. It was found at the beginning that several small improvements could be made in the machinery. Many of these have already been completed and the remainder will now be effected in the Tyne as the vessel is undergoing a general overhaul at the Middle Docks, South Shields. The owners claim that the performances of *Holzappel I* have already dem-

onstrated its success from every point of view, and careful comparisons made on all points during the whole of these voyages have similarly proved the ability of a gas-driven ship designed on the lines of *Holzappel I* to compete successfully against any other type of mechanically-driven vessel of her capacity engaged in the coasting trade. The transformers and gas engines have proved a complete success, and the *Holzappel Marine Gas Power Syndicate, Ltd.*, see no difficulty in fitting vessels of almost any size with complete installations of gas plant, gas engines and hydraulic transformers involving a considerable saving in fuel as compared with steam engines of similar power. The Power Gas Corporation, Ltd., of Stockton-on-Tees, who have done considerable pioneer work in producer gas plants generally, are encouraged by the success of this installation, and have recently prepared designs for equipping vessels of considerable size with gas producer plants to work on practically any class of coal, a distinct advance on the achievements of *Holzappel I*, where the fuel used in the producer plant is either anthracite or coke, or a mixture of these.

Bureau of Standards Investigation of the Effect of Hydraulic Tests of Boilers

In the matter of research and investigation, where the results are for the good of the community and the safety of the people, the United States is wisely carrying on work which is of the greatest value to the boiler-making world and, of course, consequently to the people at large. Lately the Bureau of Standards Washington, D. C., under the direction of Dr. S. W. Stratton and the direct supervision of Mr. James E. Howard of the Bureau, has been making tests on two boilers built twenty-eight years ago of steel. They must therefore be among the very first made of this material.

The tests are made with a view to seeing the effect of hydraulic pressures on the shell. The utmost care is being taken to do the delicate measuring without possibility of personal error, or of there being any misleading data recorded. The notes will be tabulated and will furnish information never before available. In other words, the Bureau of Standards is doing work which will allow us to eliminate in our equations an unknown or guessed-at quantity, and it seems to us that in so doing public money is being used to its very greatest advantage, as it is being turned from a small local power into a great and widespread knowledge, the value of which cannot be even moderately guessed at. We hope to publish reports of the Bureau a little later. An interesting feature is the instrument which is being used in noting the effect of hydraulic pressure on boilers in straining the shell in a horizontal plane.

Small drilled holes are made in the boiler at given distances apart. These are not large enough to weaken the boiler at all. The strain gage has a fixed point and an adjustable one. The readings of the distances between the drilled holes are first taken when the boiler has no pressure on it; again, when the pressure is put on, the gage is used and a record made of the changes due under the circumstances to the pressure shown. These gaged lengths are located at many places on the boiler, and, consequently, the effects of the weight of the water and the general conduct of the boiler under hydraulic conditions are measured and will be so tabulated as to show just what occurred.

A full account of the above-mentioned tests on two horizontal five-course tubular boilers, given by the Kendall Manufacturing Company, Providence, R. I., is given in a paper entitled "Strain Measurements of Some Steam Boilers Under Hydrostatic Pressures," by Thomas E. Howard, read before the American Society of Mechanical Engineers, New York, December, 1911.

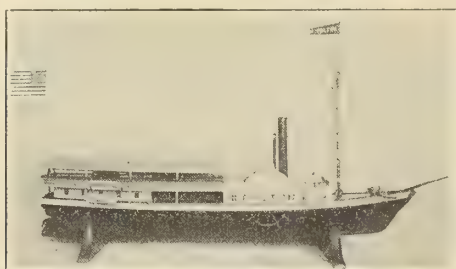
Old American Sound and Coasting Steamers—I

BY FRANCIS B. C. BRADLEE

In this article only a few of the better known and historical old-time Sound and coasting steamers will be described. To go into the subject at length would fill a large volume. As in former articles by this writer the illustrations of vessels and machinery are, in almost every instance, from the collection which the author has been many years making.

The Hudson River and Long Island Sound may not incor-rectly be termed the "Nursery of the Steamboat," for there were developed the earliest types of American steam vessels, and there the highest speeds were and still are attained. The first steamboat to ply on Long Island Sound was the *Fulton*, and after her the one that presented most interest was the *Chancellor Livingston*. The former was the last steamer built

by 8 feet high and 9 feet broad, and the fuel used was cord-wood. The *Fulton* cost all complete \$93,000 (£19,100). It may be here stated that, owing to the burning of the public buildings at Washington by the British in 1814, the drawings and specifications of the early American inventors were all lost, and therefore we possess only very meager information of an authentic character regarding the early steamboats. Being completed before the close of the war of 1812, the *Fulton* plied for a time on the Hudson River between New York and Albany, owing to Long Island Sound being block-aded by the British cruisers. As soon as peace was declared she was placed on the route between New York and New Haven, making the 52 miles that separate these two ports in an



THE PIONEER LONG ISLAND SOUND STEAMBOAT FULTON, BUILT IN 1814
(From a model owned by the N. Y., N. H. & H. R. R. Co.)

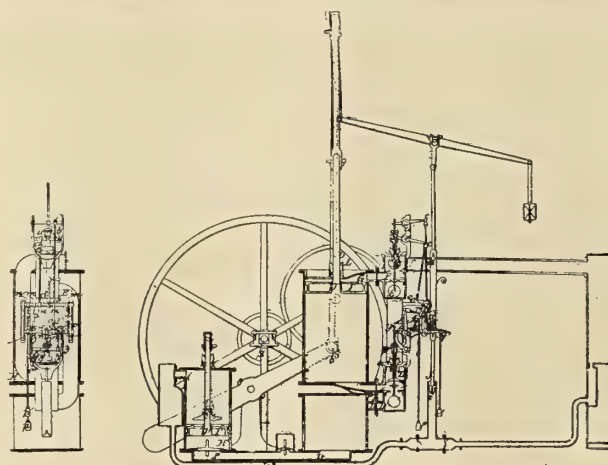
under the direct supervision of Mr. Fulton, and the latter was begun just before his death in January, 1815.

The *Fulton* was built (the material being, of course, wood) during the years 1813-14. She was 327 tons gross, 134 feet long and 26 feet beam. She was the first steamboat constructed with a round bottom like a ship, and was sloop-rigged



LONG ISLAND SOUND STEAMBOAT CHANCELLOR LIVINGSTON, BUILT IN 1817
(From a painting in possession of the author)

with a single mast, depending on her sails to increase her speed. The engine was of the "square" or "cross-head" type, built by James P. Allaire at New York, and took steam at both ends of the cylinder (the dimensions of which cannot be found), the stroke being 6 feet. The boiler was 20 feet long



ORIGINAL ENGINE OF THE CHANCELLOR LIVINGSTON (1817)

average of 10 hours and 40 minutes. She burned twenty-five cords of wood on the trip.

The following extract from the *New York Evening Post* of March 25, 1815, concerning the first trip of the *Fulton* between New York and New Haven is interesting:

"The steamboat *Fulton* commenced her trip from New York to New Haven on Tuesday last a little after 5 in the morning, and arrived at New Haven at half-past 4 in the afternoon, having completed her passage in a little more than 11 hours. From the performance of the boat at this time it may be concluded that she will not often, if ever again, be so long on her route. The machinery had not been tried since last season and was not in perfect order. Some alterations had been made in the boiler which rendered it also in some measure imperfect, she having been obliged to supply herself with such wood as the New York market offered at the opening of spring. It was of the worst kind, and the least calculated to afford the necessary supply of steam. Yet under all the disadvantages the boat completed the voyage in the time mentioned without any aid from sails.

"The facility with which she passed Hell Gate in both instances surprised everybody on board and satisfied them that no vessel can be so well calculated to navigate this dangerous channel as a steamboat. It has been supposed that the Sound could not with safety be navigated by a steamboat on account of the difficulty in passing Hell Gate, the roughness of the sea and the impossibility of making the compass traverse when attracted by so much iron as must necessarily surround it on board the boat. But these objections the passage of the *Fulton* has proved are without foundation. As to the capacity of the compass, that is tested by the fact that having no land-

marks to steer by, she made Sands' Light according to the course which the needle indicated."

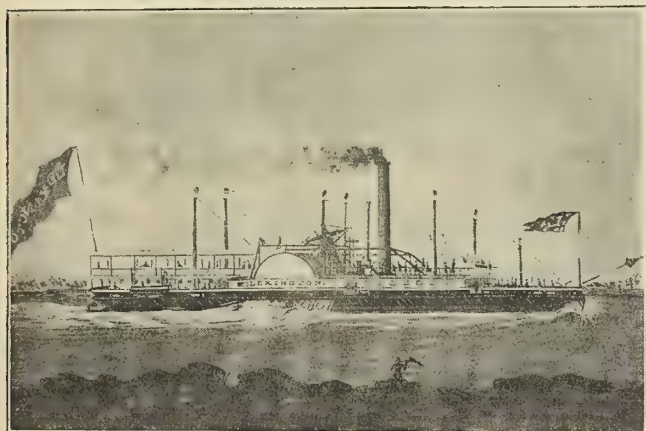
At first the *Fulton* was steered right aft by means of a long tiller, but this method being found clumsy, it was soon replaced by a wheel placed in a pilot house forward. About 1822 the *Fulton* and another steamboat called the *Connecticut* that had been running with her to New Haven, were bought by a company calling themselves the Rhode Island & New York Steamship Company, and placed on the line between Providence and New York, stopping at Newport each way, the fare being \$10.00 (£2 rs. 8d.).

The *Chancellor Livingston* was undoubtedly the most complete of Fulton's steamers, although she was finished after his death. She was constructed of oak, locust and cedar, by Henry Eckford, at New York, and no pains were spared to make her the superior of all other boats of her day as regards strength of hull, machinery, etc. She was 496 tons (gross), 157 feet

and built for him in 1835 by Bishop & Simonson, New York. This steamer had very peculiar lines, being low at the bow and stern, and higher amidships (this can be seen in the picture of her). She was just the reverse from the present style of shipbuilding. The hull of the vessel was heavily built of white oak and cedar, with the frames close together, and she had a very high and short hog frame. The dimensions were



LONG ISLAND SOUND STEAMBOAT STATE OF MAINE, BUILT IN 1848
(From a rare photograph owned by Elisha T. Jenks, of Middleboro, Mass.)



LONG ISLAND SOUND STEAMBOAT LEXINGTON (1835)
(From the original painting, drawn to scale by Jas. Bard in 1838 and now owned by Elisha T. Jenks, of Middleboro, Mass.)

long, 33½ feet beam and 10 feet depth of hold; the machinery being of the "crosshead" type and having one cylinder of 44 inches in diameter, 5 feet stroke, horsepower 65. The engine and boiler, the latter being made of copper, were constructed by James P. Allaire, of New York, and were considered so perfect that for quite a long time all other marine engines built in the United States were more or less copied after them. At first the *Chancellor Livingston* used wood as fuel, but soon began to burn coal, it being found more preferable for keeping up steam. She was the only steamboat in the United States to do this until the early twenties.

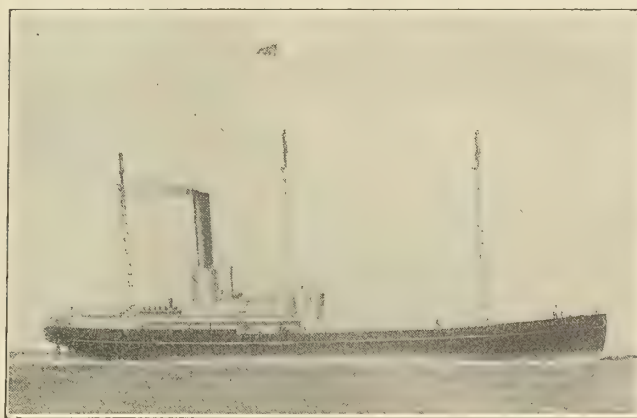
The *Livingston* ran between New York and Albany on the Hudson River from 1817 to 1828, when she was given a new boiler and engine (crosshead type) having a 56-inch cylinder by 6 feet stroke, 120 horsepower, and placed on the New York and Providence, Rhode Island line, running against the *Fulton* already mentioned. She continued there until 1832, when she was sold to Cornelius Vanderbilt and others and placed on the Boston-Portland (Maine) route, being the first steamboat to run there, and continued until 1834, when she was broken up at Boston and her engine utilized in a new steamboat called the *Portland*. The *Chancellor Livingston* was certainly not a nautical beauty, resembling more than anything else a Dutch galiot fitted with three smokestacks (she had only two when on the Hudson River service) and paddle wheels.

Before and after the *Chancellor Livingston* other steamboats called the *Benjamin Franklin*, *Providence*, *Boston*, *Washington*, etc., plied on the Sound, but they present no marked peculiarities.

In the early thirties the best known and fastest Sound steamer was the *Lexington*, owned by Cornelius Vanderbilt,

207 feet long by 21 feet beam and 11 feet depth of hold, the paddle wheels were 23 feet in diameter, and she was fitted with a beam engine built by the West Point Foundry, having a cylinder 48 inches in diameter and 11 feet stroke.

The *Lexington* ran principally between New York and Providence, and sometimes to Stonington or Hartford; her best time was 12 hours and 14 minutes from New York to Providence (180 miles) in June, 1835. She was considered the fastest boat of her day on the Sound, and often had exciting races with an opposition boat called the *John W. Richmond*, belonging to the Atlantic Steamboat Company. In those days the Steamboat Inspection Service was not yet in existence, and great liberties were taken with boiler pressures, etc., so that when races occurred, which were not infrequent events, steamboat traveling in the United States was as risky



LONG ISLAND SOUND SCREW STEAMER PELICAN, OF 1851
(From a lithograph in the author's possession)

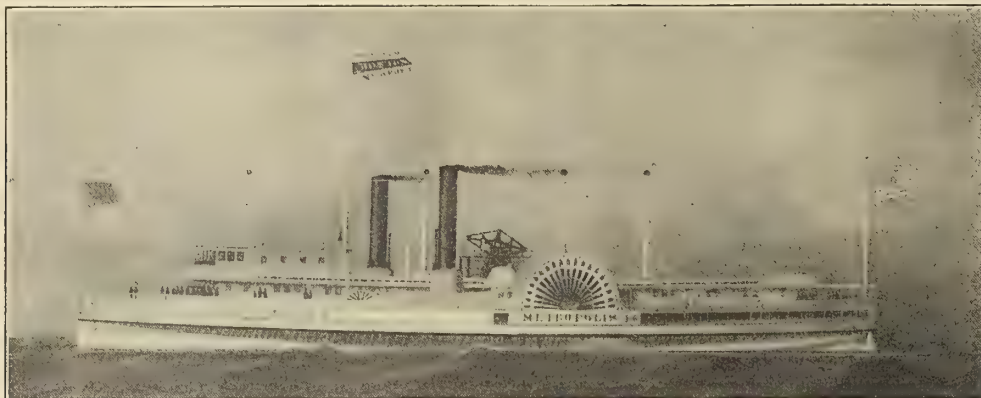
as it was exciting. Morrison, in his History of American Steam Navigation, says of the *Lexington*, "that when she was pressed hard, the roar of the fires could be heard all over the boat and at each revolution of the wheels she trembled from stem to stern."

The *Lexington* was the scene of one of the most memorable and at the same time awful disasters that ever occurred on Long Island Sound. On Jan. 13, 1840, while on her way to Stonington from New York, she caught fire when off Eaton's Neck, Long Island. The fire spread so rapidly that the engineer was driven away from the machinery before it could

be stopped, and at the same time the wheel ropes (this was before chains were used) were burned off, so that the *Lexington* drifted down the Sound at full speed, helpless. The weather was bitterly cold, and most of the boats were swamped while lowering, and, to make a long story short, about 140 persons were either drowned, burned or frozen to death. There were only four survivors.

inch. One great feature also of the *Bay State* was the fact that "she had thirty separate staterooms, which could be had for \$1.00 (4s. 2d.) each." This was much commented on in the newspapers of the day.

In point of speed the *Bay State* completely outstripped the then crack boats *Oregon* and *C. Vanderbilt*, plying on the Stonington line and ran from New York to Newport on her



LONG ISLAND SOUND STEAMBOAT METROPOLIS (1854)
(From a painting in possession of the Fall River Line)

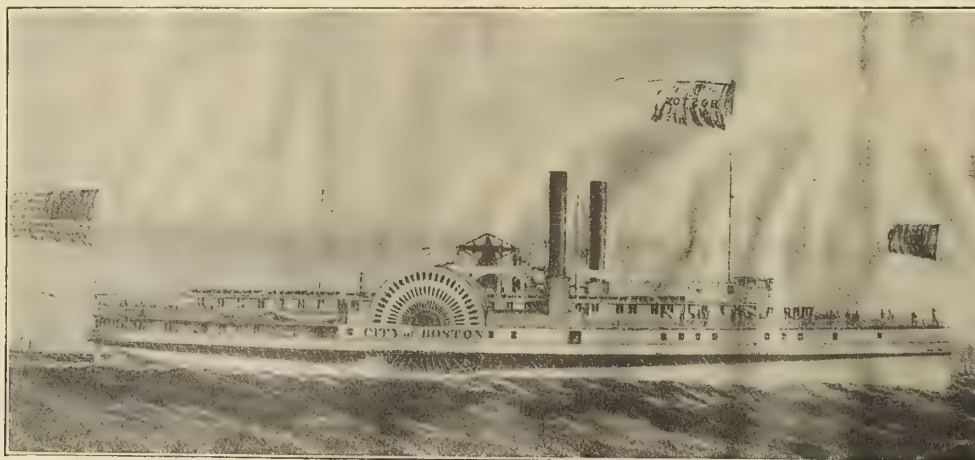
Other well-known steamboats at this time were the *Massachusetts* and *Rhode Island*, both built at New York in 1836, and plying on the Providence line. The former was 202 by 30 by 12 feet, with two beam engines and two copper boilers on the guards; the latter measured 211 by 28 by 10 feet, having a "cross-head" engine, cylinder 50 inches in diameter by 11 feet stroke.

The now well-known Fall River line was organized in 1847, under the name of the Bay State Steamboat Company. Until the completion of their new steamer, the *Bay State*, they char-

tered a screw vessel named the *Eudora*, one of the first ever used on the Sound. She measured 155 by 28 by 9 feet, with what was known as a "simple engine," and during the gold excitement in California was sold for use on that coast. The *Bay State*, when completed, was considered the finest and fastest steamboat in American waters; she was constructed at New York by Samuel Sneedon and measured 317 feet in length, 39 feet beam and 13½ feet depth, tonnage (gross) 1,554; the machinery was built by the Allaire Works at New York and consisted of a beam engine having a cylinder 76 inches in diameter, 12 feet stroke, and making on an average 18 revolutions per minute. There were two iron boilers on the guards carrying steam at a pressure of 25 pounds to the square

first trip in May, 1847, in 9 hours 15 minutes. The *Oregon* and *C. Vanderbilt* above referred to were owned by George Law and Cornelius Vanderbilt, respectively, and measured: *Oregon*, 318 by 35 by 10 feet, beam engine, cylinder 72 inches in diameter, 11 feet stroke, and *C. Vanderbilt*, 300 by 35½ by 10½ feet, beam engine, cylinder 72 inches in diameter, 12 feet stroke.

Another steamboat which should be mentioned here was the *Atlantic*, built by Bishop & Simonson, New York, in 1846 for the New London route. She was 320 by 36 by 10 feet, with



LONG ISLAND SOUND STEAMBOAT CITY OF BOSTON (1860)
(From an original lithograph in the author's possession)

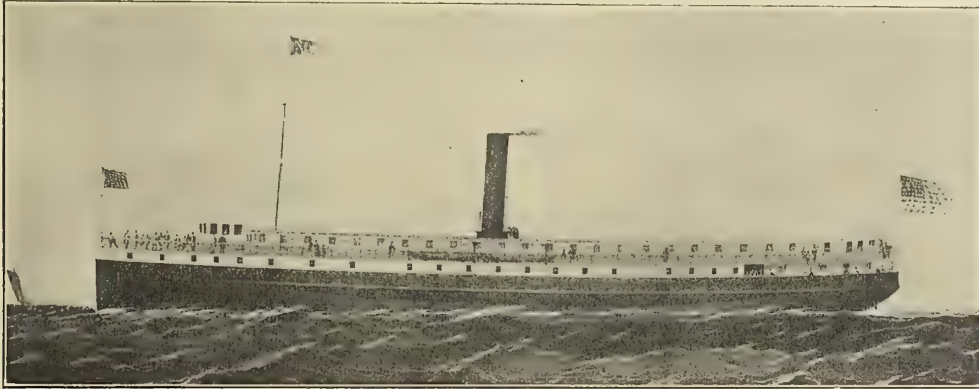
tered a screw vessel named the *Eudora*, one of the first ever used on the Sound. She measured 155 by 28 by 9 feet, with what was known as a "simple engine," and during the gold excitement in California was sold for use on that coast. The *Bay State*, when completed, was considered the finest and fastest steamboat in American waters; she was constructed at New York by Samuel Sneedon and measured 317 feet in length, 39 feet beam and 13½ feet depth, tonnage (gross) 1,554; the machinery was built by the Allaire Works at New York and consisted of a beam engine having a cylinder 76 inches in diameter, 12 feet stroke, and making on an average 18 revolutions per minute. There were two iron boilers on the guards carrying steam at a pressure of 25 pounds to the square

a beam engine having a 72-inch cylinder by 11 feet stroke. Hunt's *Merchant's Magazine* speaks of her "as being lighted by gas and having watertight bulkheads which would prevent the inrush of water from one part of the hull to another in case of collision, etc." If this statement was correct she was probably the first American steamboat to have watertight bulkheads. The *Atlantic* was lost on Nov. 25, 1846, the primary cause being the breaking of the main steam pipe, which left her helpless in a violent northwest gale so that she drifted ashore on Fishers' Island near New London and about 30 persons were lost.

After the *Bay State*, the Fall River line built in 1848 the *Empire State*, of nearly the same size and dimensions, and in

1849 they bought the *State of Maine*, a steamboat that had been built the year before to run between Boston and Bangor (Maine), but proved too large and expensive for that route. She was constructed of wood, at New York, by J. Simonson, and measured 806 tons gross, length 236 feet, beam 31 feet, and depth of hold 11½ feet; the engine was of the vertical beam type, having one cylinder 54 inches in diameter, 11 feet

braced and iron strapped diagonally, thus doing away with the hog frame, as by this time it began to be recognized that the light Hudson River type of steamboat was not suited to the heavy weather sometimes to be met with on Long Island Sound. The tonnage was 2,210 gross; dimensions, length 325 feet; breadth, 42 feet; depth of hold, 16 feet, there being sleeping accommodations for over 600 passengers. The



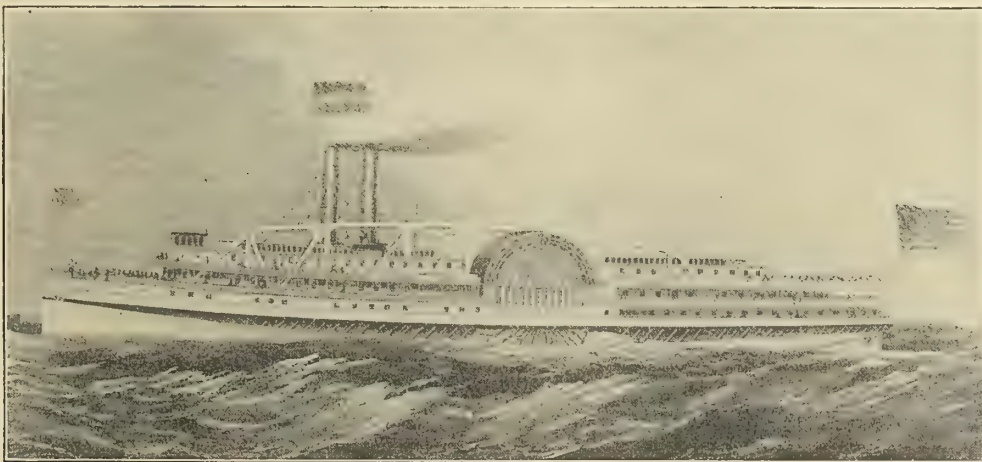
THE NEPTUNE STEAMSHIP COMPANY'S SCREW STEAMER ELECTRA

stroke. The picture of the *State of Maine* is from a rare photograph in the possession of Elisha T. Jenks, of Middleborough, Mass., and represents her when she was used as a hospital boat on the James River, Virginia, during the Civil War. She was afterwards sold for use in the West Indies.

A concern called the Commercial Steamboat Company started in 1851 a line of steamers driven by screw propellers called the *Pelican*, *Petrel* and *Osprey*, the two latter being 135 by 24 by 8 feet draft. These boats were to run between New York and Providence for freight purposes. They were most

Metropolis's machinery was built by Stillman, Allen and Co., New York, and consisted of a very powerful vertical beam engine having a cylinder 105¼ inches in diameter, 12 feet stroke of piston (the cylinder up to that time was the largest ever cast for a marine engine), there were four iron boilers on the guards, two on either side, set back to back, and having a total heating surface of 12,000 square feet.

The *Metropolis* may be considered one of the most famous steamers ever built in the United States; she was capable of running 20 statute miles per hour, and her fastest trip was



LONG ISLAND SOUND STEAMBOAT BRISTOL (1866)

(From an engraving in the author's possession)

curious-looking crafts, as may be seen by the picture of the *Pelican*. The *Pelican* was of 351 gross tons, built of oak at Philadelphia in 1851. The dimensions were 132 by 24 by 9 feet. The engines were of the direct-acting type, having two cylinders, each 28 inches diameter by 28 inches stroke. These must have been among the very earliest direct-acting propeller engines, as most of them at that time were "geared down" to the propeller in one way or another.

By 1854 the traffic had increased to such an extent that another steamer was needed on the Fall River line, and so they had the *Metropolis* constructed by Sneden & Whitlock, at Greenpoint, Long Island. She was very heavily built of wood, the hull timbers being carried to the second deck, strongly

from New York to Fall River (181 miles), June 9, 1855, in 8 hours 21 minutes. Eventually she was broken up at Boston in 1879. At this period business was so good on the Sound that it is recorded that in 1850 the Fall River line paid dividends at the rate of 6 percent per month for ten consecutive months.

After the *Metropolis* appeared, a competing line, the Norwich & New London Steamboat Company (which owned the *Plymouth Rock* and other steamers), had built the *Commonwealth* especially to beat her, but although very fast she failed to do so. She was built of wood at Greenpoint, Long Island, by Lawrence & Foulkes, the dimensions being 316 by 42 by 13½ feet. The engine was of the vertical beam type, having one

cylinder 76 inches in diameter, 12 feet stroke. The *Commonwealth* was burned at her dock at Groton, Connecticut, in December, 1865.

After the *Metropolis* and *Commonwealth* no steamboats of especial note appeared on the Sound until 1861, when the New London line had the *City of Boston* and *City of New York*, built of wood, by Sneden & Rowland, at Greenpoint, Long Island. They were 1,591 tons gross each, 300 feet long, 40 feet beam, and 12½ feet depth of hold, the engines were of the vertical beam type built by the Novelty Iron Works, New York, and each having a cylinder 80 inches in diameter, 12 feet stroke, the indicated horsepower being 1,800. These boats were considered among the finest and fastest of their day on the Sound. The *City of Boston*, soon after she was built, succeeded in passing the famous *Metropolis*, and on July 4, 1865, ran from New York to New London (120 miles) in 6 hours and 5 minutes. She and the *City of New York* were broken up at Boston in 1896.

In 1863, the Neptune Steamship Company was organized to run between Providence and New York, and they brought forward the first really large screw steamers on the Sound. These were the *Electra*, *Galatea* and *Oceanus*, built of wood at New York in 1864, by J. Van Deusen, each steamer being 240 feet long, 40 feet beam and 17 feet depth of hold, having two simple condensing engines with cylinders 44 inches in diameter, 3½ feet stroke. These boats, although intended principally for freight, had accommodations for a limited number of passengers.

During the late sixties, the best known Sound steamboats were the *Newport* and *Old Colony* (1865), of the Fall River line, and the *Bristol* and *Providence* (1867), which were owned at first by the Narragansett Steamship Company, and afterwards by the Fall River line. The *Newport* was built of wood at Greenpoint, Long Island, by John Englis & Son (the *Old Colony* was a good deal like her, only slightly smaller, and had only two stacks in place of the *Newport's* four), measuring 2,150 tons gross, 350 feet long, 43 feet beam and 14 feet depth of hold. Her hog frame was the heaviest ever placed in a steamer up to that time. The engine, built by the Novelty Iron Works, New York, was of the vertical beam type, having a cylinder 85 inches in diameter, 12 feet stroke; there were four iron boilers on the guards, and the paddle wheels were 42 feet in diameter. The *Newport* presented a most peculiar appearance, having four smoke stacks, something that has never been seen before or since on Long Island Sound. She was converted into a coal barge in 1889.

The *Bristol* and *Providence* (sister ships), which followed in 1867, were two of the most celebrated steamboats ever built. Constructed of white oak by William H. Webb, at New York, they were each 2,962 tons gross, 362 feet long, 48 feet beam, 16½ feet depth of hold; the two ships cost \$2,500,000 (£514,000), and they were built in the most substantial manner; every beam was bolted fore and aft, and cross-braced with iron from keel to the top of the paddle boxes, in addition to being strengthened by heavy hog frames. There were also numerous watertight bulkheads. Each ship had room for 1,200 passengers, and a great quantity of deck freight. The interior fittings of the *Bristol* and *Providence* were most luxurious, gas lighting, and later on steam-heating and steam-steering gear was installed. Each boat carried a band of music and the officers and crews wore uniforms—two innovations that helped make them famous. Their machinery, built by the Morgan Iron Works, New York, was of the usual vertical beam type, each engine having a cylinder 110 inches in diameter, 12 feet stroke, and making 18 revolutions per minute. Each boat had three iron flue and tubular boilers, carrying a pressure of 18 pounds to the square inch, and the paddle wheels were 38 feet 8 inches in diameter.

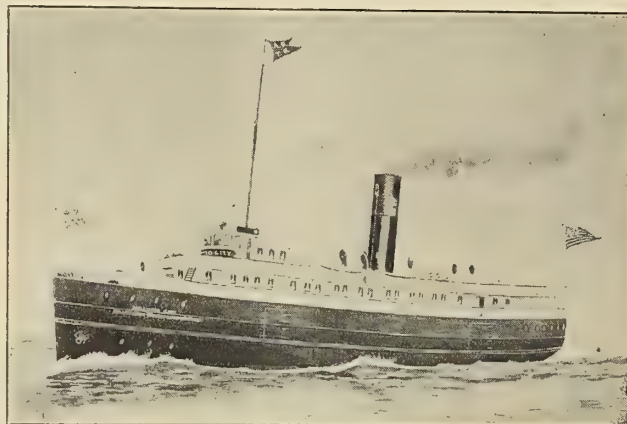
These steamers were so fast and popular that the Fall River

service was carried on without any further additions until the modern boats *Pilgrim* and *Puritan*, etc., were built. The *Bristol* was accidentally burned at her wharf at Newport, Dec. 30, 1888, and the *Providence* was burned for the metal in her hull on one of the islands in Boston harbor in August, 1901. With these two steamboats ends the "old era" on Long Island Sound, for, with the exception of the *Rhode Island*, built in 1873, for the Stonington line, and followed by the *Massachusetts* in 1877 and the *Connecticut* in 1889 (the latter boat being a grand failure), all the Sound steamboats have been built of iron or steel, and so do not come within the scope of this article.

New Steamer for New York and Atlantic City Route

The Atlantic City Transportation Company has under construction a new steel freight and passenger steamer for its new route between New York and Atlantic City. The hull was completed at the yard of Kyle & Purdy, City Island, N. Y., and launched March 4, and was taken to the yard of the Staten Island Shipbuilding Company, Port Richmond, N. Y., to receive the machinery and joiner work.

The new vessel is of steel construction to the promenade



ATLANTIC CITY BOAT

deck, with wooden house and hurricane deck above. The hull is of the following dimensions:

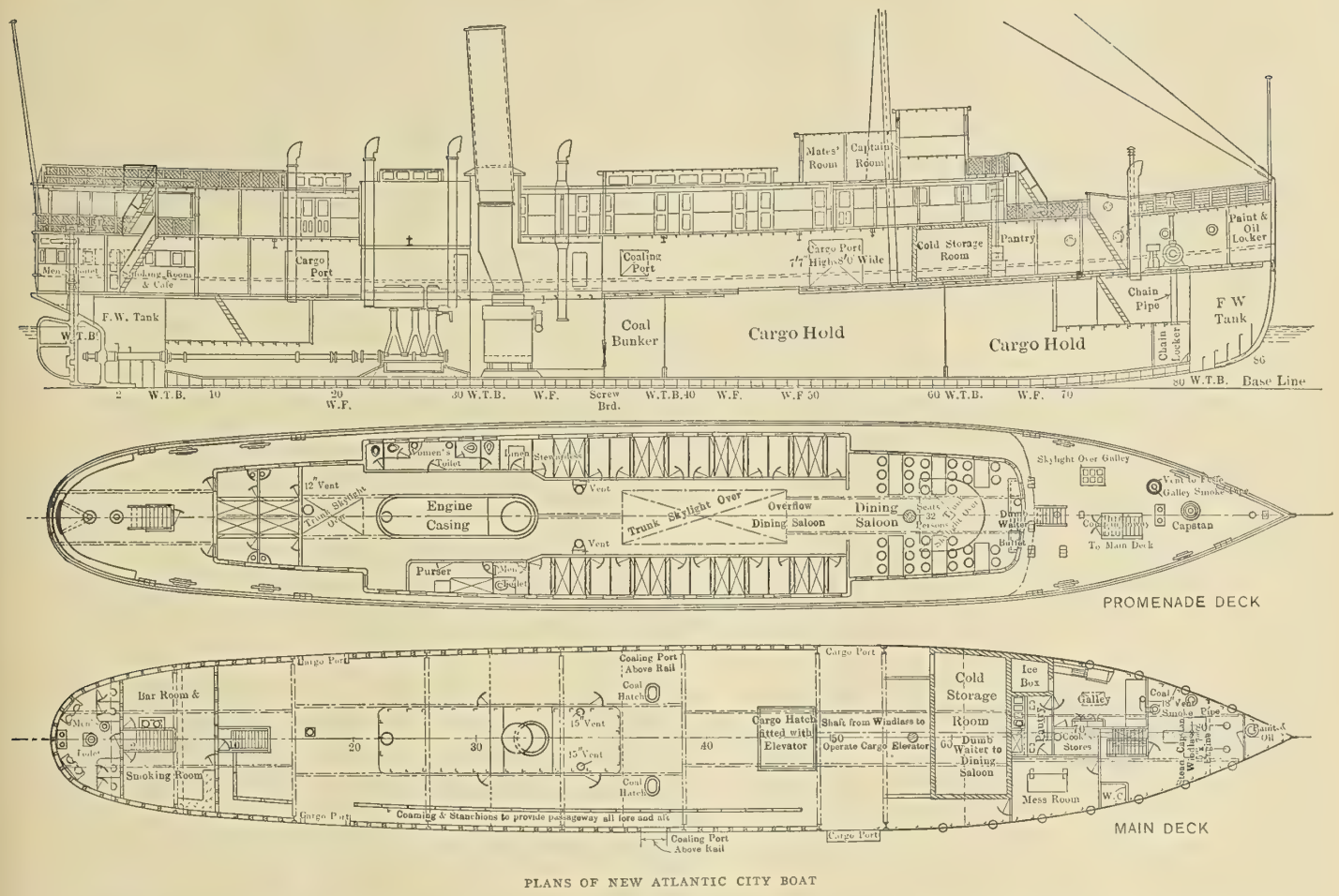
Length on load waterline.....	175 feet 6 inches.
Length over all.....	186 feet.
Molded beam	28 feet 6 inches.
Molded depth to main deck.....	14 feet 6 inches.
Molded depth to upper deck.....	23 feet 4 inches.

The propelling machinery consists of a triple-expansion engine with cylinders 15¼ inches, 23¾ inches, 37½ inches and 26 inches stroke. Steam is furnished by two Almy watertube boilers, with a total grate surface of 95.46 square feet, and a total heating surface of 3,428 square feet. The pumps were furnished by the Warren Steam Pump Company.

The vessel is arranged to suit all conditions met with on this route, and no pains have been spared to secure seaworthiness and the comfort and safety of the passengers and crew. The lifeboat and liferaft equipment will be of the best and of unusually large capacity for a steamer of this description.

The arrangements, as shown on the accompanying plans, provide sleeping accommodations for about 100 first class passengers, and ample freight space on the main deck and in the lower hold.

The Atlantic City Transportation Company has been operating a line of steamers between Atlantic City and Philadelphia for several years, and is adding this new vessel to extend its



traffic to New York City. With a steamer of this description it is expected that the route will become popular with the passenger trade, as the vessel will maintain a speed of nearly 18 miles per hour, which will make the running time a little over six hours.

Atlantic City's commerce by water routes was over 60 percent greater in 1911 than in 1910. The United States government, the State government of New Jersey and the Atlantic City municipal government have appropriated \$320,000 (£65,750), \$50,000 (£10,280), \$50,000 (£10,280), respectively, for the work to be commenced at once.

The owners' interests in the matter of plans, supervision, etc., have been cared for by Mr. George B. Drake, naval architect, 17 Battery Place, New York. It is expected that the vessel will be in service not later than May 15.

Prize Competition for Designs of a Passenger Canal Boat for the District of Teltow, Germany

In November, 1910, the District of Teltow, Germany, invited proposals of designs for a passenger steamer suitable for traffic on the Teltow Canal and the Prinz-Friedrick-Leopold Canal near Berlin. The conditions set forth were as follows:

Length over all.....	98.5 feet.
Breadth, extreme	18 feet.
Draft, extreme	3.94 feet.
Highest fixed point above waterline....	1.3 feet.
Speed, in deep water.....	8.63 knots.

The seating capacity was to be as large possible. No specific requirements was stated as to the means of propulsion except that they must be arranged in such a manner to avoid damage to the canal bed and sides. The depth of water in the Teltow

Canal is 8.2 feet and in the Prinz-Friedrick-Leopold Canal 4.9 feet.

The first and second prizes were \$315 (£65) each, and the third prize \$100 (£20.5). The prize winners were the following:

First Prize—Mr. R. Blühmke and Mr. F. Peters, Mannheim Schiffswerft.

Second Prize—Mr. F. Mendelsohn and Mr. W. Teubert, Dipl. Ing., Potsdam.

Third Prize—Mr. E. Van der Werf, Blohm & Voss, Hamburg.

Reports which are being received from European countries regarding the appointment of delegates to the Twelfth International Congress of Navigation, which will convene in Philadelphia on May 23, indicate that the attendance will be in excess of expectations, and that the Congress, including the American attendance, will in all probability be the largest ever held. As the time draws near for the opening of this convention a number of the Eastern cities are laying plans to obtain a visit from the distinguished engineers who will come as representatives of foreign countries. These efforts are being seconded by important manufacturing corporations, which realize the value of having so large a number of engineers from abroad visit their works to carry away with them a knowledge of methods and products of this country. Pittsburgh, the greatest tonnage producing district in the world, has been quick to see the value that it will be to its interests to be visited by the engineers. It is expected that virtually all of the delegates to the Congress will make the trip to Western Pennsylvania to see the industries of this district. The big corporations in Pittsburgh are co-operating with the city authorities to make the visit of the engineers in every way notable. Boston, Buffalo, Cleveland, Detroit and Chicago are among the cities to be visited by parties of the engineers following the Congress.

The United States Turbine-Driven, Naval Collier Neptune

The naval collier *Neptune*, recently finished by the Maryland Steel Company at Sparrow's Point, Md., marks the latest advance in this type of vessel. She is the largest and best appointed collier constructed to date, and embodies many new and novel features. To recapitulate, the general dimensions are as follows:

Length over all.....	542 feet.
Length on waterline.....	520 feet.
Beam, molded.....	65 feet.
Depth, molded to upper deck.....	39 feet 6 inches.
Forecastle, 8 feet.....	85 feet.
Poop, 8 feet.....	171 feet.
Load draft, molded.....	27 feet 6 inches.
Displacement on load draft.....	19,440 tons.
Deadweight.....	13,040 tons.
Block coefficient.....	.727
'Midship section coefficient.....	.982

The general design for this collier was developed by the builders in accordance with the requirements of the Navy Department, and, as will be seen from the illustrations, com-

prises six large holds for coal, the forward one being subdivided into four for the carrying of fuel oil in place of coal when required. There are also four oil compartments below the lower deck forward. Top-side tanks are fitted in way of cargo holds in addition to the usual double-bottom tanks. At the ends of the vessel there are three decks in addition to the poop and forecastle.

land Steel Company, the winches being purchased from the Lidgerwood Manufacturing Company, New York. As will be seen the gear consists of a series of structural towers connected together at the center line near the top by a girder, which also serves as a track for a fore-and-aft trolley to transship coal from one hold to another in order to maintain trim when on long voyages, or to replenish the bunkers. All of the towers, except the forward one, are fitted with four booms. The heads of opposite booms are connected by wire rope spans, on which travels a trolley. The trolley is manipulated by means of in-haul and out-haul ropes led over the ends of the booms. The requirements of the Navy Department were that the gear should handle 100 tons per hatch per hour, using a 15-cubic yard clam-shell bucket. This requirement was exceeded on test, no difficulty being experienced in delivering 110 tons per hour. The Maryland Steel Company has applied for patents on this type of coaling gear.

PROPELLING MACHINERY

The propelling machinery consists of two 4,000-horsepower Westinghouse marine turbines, running normally at 1,230



FIG. 1.—UNITED STATES COLLIER NEPTUNE

prises six large holds for coal, the forward one being subdivided into four for the carrying of fuel oil in place of coal when required. There are also four oil compartments below the lower deck forward. Top-side tanks are fitted in way of cargo holds in addition to the usual double-bottom tanks. At the ends of the vessel there are three decks in addition to the poop and forecastle.

The officers and crew have commodious quarters in the poop, in a house on the poop deck, and on the berth and lower decks below.

The hull is constructed of steel in excess of the requirements of the American Bureau of Shipping. The joiner work is tasteful, generally of white pine, enameled. The officers' rooms are trimmed in oak. All toilets and baths are tiled and fitted with the most modern type of fixtures, the bath rooms being supplied with hot and cold fresh and salt water. The floors in the living quarters are covered with best Navy linoleum. A complete set of engine-room telegraphs, inter-communicating telephones and annunciators is installed.

The principal point of interest in this vessel is, of course, the coaling gear. This was designed and installed by the Mary-

land Steel Company, the winches being purchased from the Lidgerwood Manufacturing Company, New York. As will be seen the gear consists of a series of structural towers connected together at the center line near the top by a girder, which also serves as a track for a fore-and-aft trolley to transship coal from one hold to another in order to maintain trim when on long voyages, or to replenish the bunkers. All of the towers, except the forward one, are fitted with four booms. The heads of opposite booms are connected by wire rope spans, on which travels a trolley. The trolley is manipulated by means of in-haul and out-haul ropes led over the ends of the booms. The requirements of the Navy Department were that the gear should handle 100 tons per hatch per hour, using a 15-cubic yard clam-shell bucket. This requirement was exceeded on test, no difficulty being experienced in delivering 110 tons per hour. The Maryland Steel Company has applied for patents on this type of coaling gear.

The turbines are of the combination impulse and reaction type. Each turbine comprises an "ahead" and an "astern" element on a single rotor in a single casing. Fig. 4 is a view of one of the turbines with the cover removed. The left-hand end with the larger number of rows of reaction blades is the ahead element, and the right-hand end, consisting of one row of impulse blades and only six rows of reaction blades is the astern or backing element. The exhaust connection is at the low-pressure end of the ahead turbine. The rotor being hollow the vacuum reaches back to the astern element, so that the latter does not offer any resistance when the ship is going ahead. When going astern the backing element exhausts through the hollow rotor.

The joint between the upper and lower halves of the casing, instead of being in a horizontal plane as is usual, is inclined at a very decided angle. This feature of the design makes it

possible to connect the steam exhaust pipes to the bottom half of the casing, so that the cover may be swung open on hinges without breaking any important pipe connections, so that the rotor and blading may be exposed for inspection with a minimum expenditure of time and labor.

In marine installations the condenser cannot usually be located below the turbine casing, and the exhaust coming from the bottom of the casing, with an upward sweep to the condenser, acts like the "entrainer" that is considered essential in exhaust pipes leading to barometric condensers, and effectively voids the turbine of water that would otherwise tend to collect in the bottom of the casing.

Fig. 5, from a photograph of one of the *Neptune's* turbines, shows the exhaust connection and the opening in the jacket for the steam connections to the ahead and astern sections. This illustration also shows the hinges on which the cover swings.

The total weight of the two turbines and two reduction gear sets installed in the *Neptune* is only 235,364 pounds. A sister ship, the *Cyclops*, is fitted with reciprocating engines of the same power, which, with their reversing and turning gear, are reported to weigh 586,000 pounds. The use of the high-speed turbines with reduction gears effects a saving of over 350,000 pounds, or almost 60 percent, in the deadweight of the main propelling engines.

Another feature of interest in this installation is the system of pneumatic tele-control, by which the turbines may be started, stopped and reversed and their speed adjusted from the bridge. Fig. 6 shows the bridge operating stand—which is practically a duplicate of the operating stand in the engine room—with its two levers for controlling the turbines independently of each other. The dial gages are connected to pipes running aft to the engine room, and their indications show instantaneously that the desired action has taken place. Of course, this bridge control does not interfere with the turbines being handled in the ordinary way by the engine room force. In case, however, of an accident to the steering gear of a twin-screw ship, its convenience and value would be recognized immediately, and it will perhaps develop that there may be many other conditions in which its desirability will be apparent.

The speed of the turbine is controlled by a centrifugal governor, the action of which is resisted by a piston working in a cylinder against an adjustable air pressure. The speed is varied by altering the air pressure, and with the governor in action at all speeds, racing, or even noticeable variation in the speed, is impossible under any circumstances.

AUXILIARY MACHINERY

There are two independent condensers, each having 5,400 square feet cooling surface. The tubes are $\frac{5}{8}$ inch outside diameter, No. 16 B. W. G. thick, and are tinned. Two centrifugal circulating pumps, having 14 inches suction and discharge, driven by 10-inch by 9-inch vertical engines, are installed in connection with condensers. An auxiliary condenser of 1,000 square feet cooling surface, with attached air and circulating piston pumps, is installed for port use.

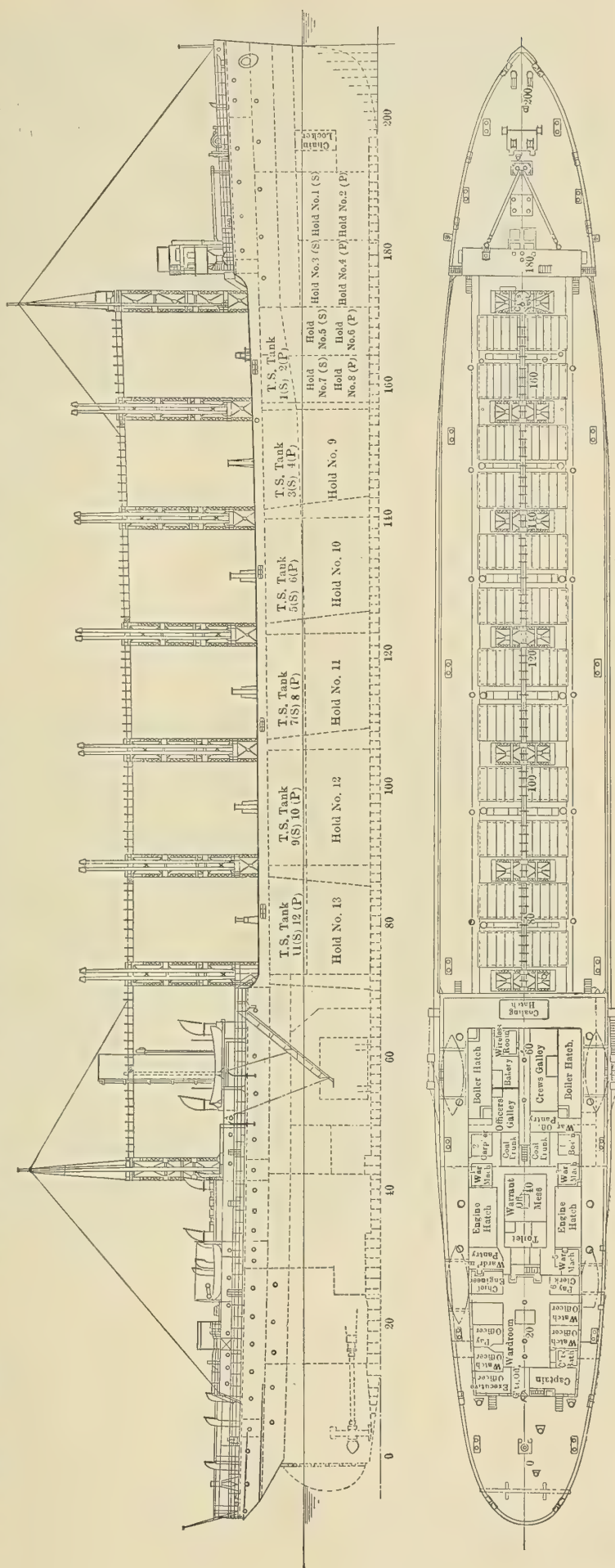


FIG. 2.—DECK PLAN AND PROFILE OF THE NEPTUNE

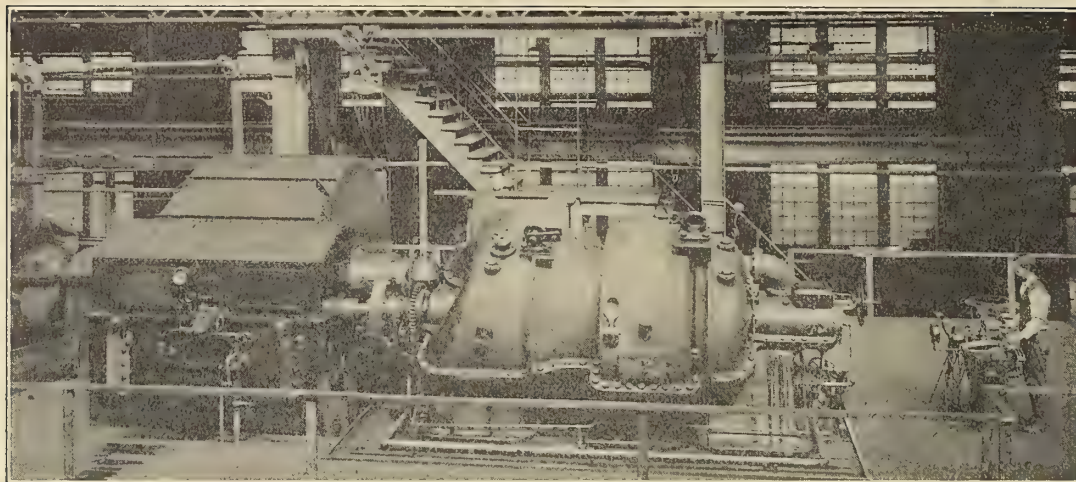


FIG. 3.—ONE OF THE NEPTUNE'S TURBINES WITH REDUCTION GEAR, ERECTED IN THE BUILDER'S SHOPS

There are two main and one auxiliary feed pumps, each of the vertical simplex type, 14 inches by 10 inches by 24 inches. Connection is only made between the fresh water supply and boilers. These pumps discharge through a cartridge type grease extractor and multi-coil feed heater, or can be by-passed direct to boilers. One duplex ballast pump, 12 inches by 14 inches by 12 inches, is provided for pumping out the double-bottom tanks and for pumping up the top-side ballast tanks.

One $5\frac{1}{4}$ -inch by $4\frac{3}{4}$ -inch by 5-inch vertical duplex evaporator feed pump.

One 7-inch by 4-inch by 7-inch horizontal simplex donkey boiler feed pump.

One 12-inch by 14-inch by 18-inch vertical duplex cargo oil pump.

Two evaporators, each of 20 tons capacity, per 24 hours, and two distillers, each of 1,500 gallons capacity, are installed, and there is a steam driven, ammonia type refrigerating plant to

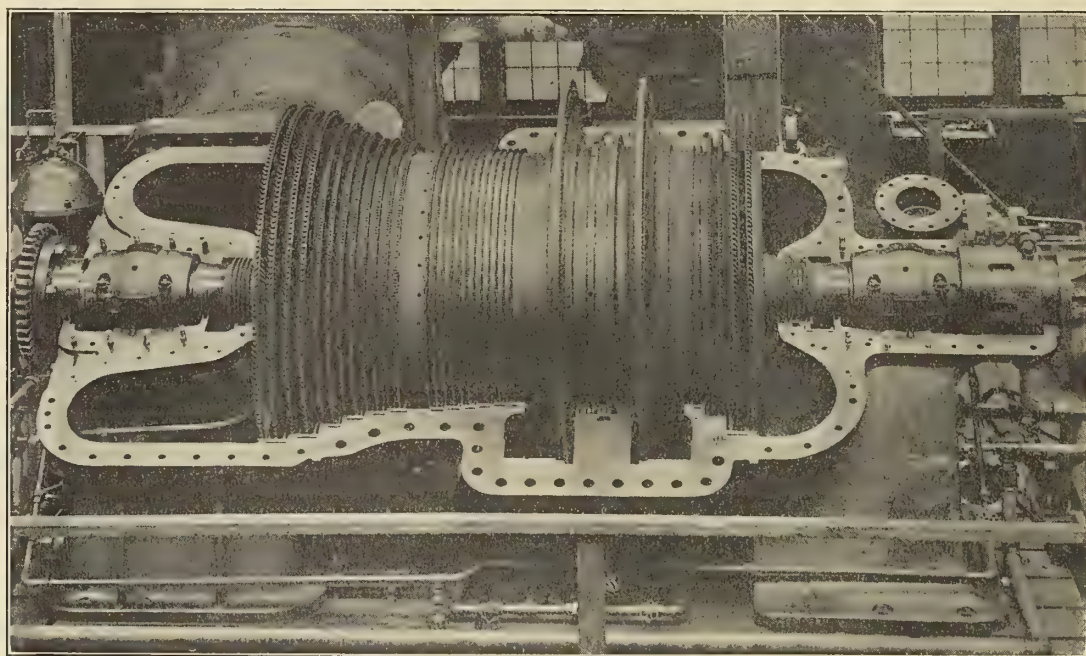


FIG. 4.—TURBINE WITH COVER REMOVED

The following is a list of the small pumps provided and connected up to perform their respective duties:

One 6-inch by 10-inch by 12-inch horizontal simplex bilge pump.

One 10-inch by $7\frac{1}{2}$ -inch by 12-inch vertical duplex fire pump.

One $5\frac{1}{4}$ -inch by $4\frac{3}{4}$ -inch by 5-inch vertical duplex fresh water pump.

One 6-inch by $5\frac{3}{4}$ -inch by 6-inch vertical duplex sanitary pump.

One 6-inch by $5\frac{3}{4}$ -inch by 6-inch vertical duplex distiller circulating pump.

cool a room of 2,000 cubic feet volume for ship's stores.

Two 15-kilowatt, 125-volt, direct-connected electric generating sets are installed.

There are three double-end main boilers, built for a working pressure of 200 pounds, each 15 feet $10\frac{1}{2}$ inches mean diameter by 21 feet 4 inches long, with four 40-inch corrugated furnaces in each end, each furnace having a separate combustion chamber. The total heating surface is 18,920 square feet. A hot air forced draft system is installed, the air being furnished by two blowers, each capable of delivering 30,000 cubic feet of air per minute to the furnaces.

There is one donkey boiler, 8 feet diameter by 10 feet 6

inches long, built for 200 pounds working pressure and for natural draft. It is fitted with one 44-inch corrugated furnace, and has 650 square feet heating surface.

The winches on the *Neptune* were furnished by the Lidgerwood Manufacturing Company, of New York. There are two winches for each hatch, the control levers of which are brought to one operator, who stands looking down into the

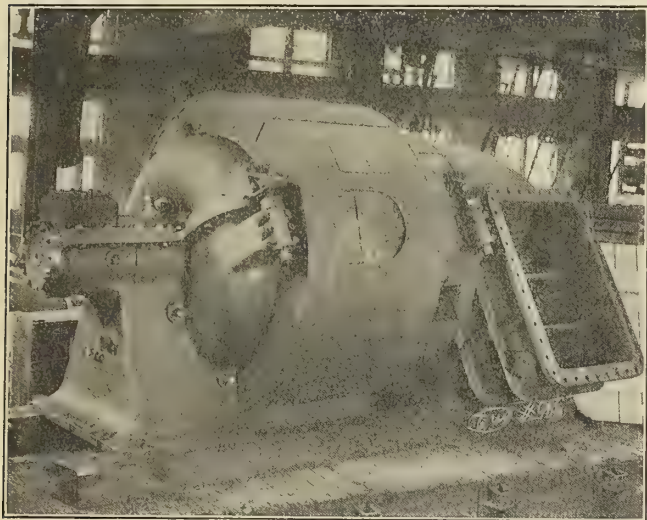


FIG. 5.—VIEW OF TURBINE, SHOWING EXHAUST AND STEAM CONNECTIONS

hatch. These winches are of the Lidgerwood universal type, which are adapted to operate the marine transfer as installed on the *Neptune* or to do any other of the regular work of cargo discharge. They will hoist 3 to 4 tons on a single line with rapidity and certainty, and are under absolute control, both in hoisting and lowering.

When the marine transfer is used one of these winches hoists, opens and closes the bucket, while the other winch swings the bucket from the hatch to the end of the boom. Each winch is controlled by a single operating lever, although a foot brake is brought into the operation on the bucket winch when it is necessary to open and close the bucket. One hun-



FIG. 6.—BRIDGE OPERATING STAND

dred tons of coal per hour has been discharged by each pair of winches from the hold of the collier to a lighter, ship or dock alongside. The winches are of very sturdy construction. They have 9-inch by 10-inch double cylinders and piston valves. The working pressure is 150 pounds. The gearing is of steel and pinions of bronze, all with machine-cut teeth. The gears and pinions are entirely covered with guards, so that it is practically impossible to catch any foreign substances in the gears, and also permits of very efficient lubrication. This makes a very quiet, smooth running winch and reduces the vibration to a minimum. The life of this gearing is consider-

ably longer than the regular machine molded teeth, and the efficiency is considerably greater.

The frictions are of the Spencer Miller metallic type, which are not affected by water or operating conditions. The brake on the bucket engine is all metallic, thus avoiding all troubles which heretofore have been so common aboard ship. An automatic brake is furnished on the swinging winch, which holds the winch stationary against any load which the winch is capable of hoisting when the steam is shut off by the operating valve. This automatic brake makes the operation simple and safe without any care or attention on the part of the operator.

All sheaves and bearings are bushed either with bronze or babbitt metal, so that in no case does iron or steel come against other iron or steel, which fact insures the operation of these engines no matter for what time they have been out of service. There is nothing exposed to the weather which is not simple, or which has any tendency to corrode or be injured through exposure. The parts of all of the winches are interchangeable, so that in case of any breakdown a similar part from another winch can be used with the certainty that it will fit.

Institution of Naval Architects

The annual meeting of the Institution of Naval Architects for 1912 was held in the hall of the Royal Society of Arts, John street, Adelphi, March 27 to 29. The following papers were read and discussed:

WEDNESDAY, MARCH 27

1. Some Military Principles which Bear on Warship Design. By Admiral Sir Reginald Custance, K. C. B., K. C. M. G., C. V. O.
2. On Turning Circles. By Prof. W. Hovgaard.
3. The Law of Comparison for Surface Friction and Eddy-Making Resistances in Fluids. By T. E. Stanton, D. Sc.
4. Description of the William Froude National Tank (Part II). By G. S. Baker.

THURSDAY, MARCH 28

5. Results of Trials of the Diesel-Engined Seagoing Vessel *Selandia*. By W. I. Knudson.
6. Gas Power for Ship Propulsion. By A. C. Holzapfel.
7. The Effect of Bilge Keels on the Rolling of Lightships. By George Idle and G. S. Baker.
8. Results of Calculations Regarding the Effect of an Internal Free Fluid Upon the Initial Stability and the Stability at Large Angles in Ships of Various Forms. By A. Cannon.
9. On the Solignac-Grille Boiler and Its Application in French Channel Steamers. By Monsieur G. Hart.
10. Results of Experiments on Watertube Boilers, with Special Reference to Superheating. By Harold E. Yarrow.

FRIDAY, MARCH 29

11. Geared Turbine Channel Steamers *Normannia* and *Hantonia*. By Prof. J. H. Biles, LL. D., D. Sc.
12. Performance on Service of the Channel Steamer *Newhaven*. By Monsieur P. Sigaudy.
13. On the Measurement and Automatic Recording of Dead Reckoning. By F. R. S. Bircham.
14. Description of a Tide Indicator. By Commander G. J. Baugh, R. I. M.
15. The Arrangement of Boat Installations on Modern Ships. By A. Welin.

16. Torsional Vibrations of Elastic Shafts of any Cross Section and Mass Distribution, and Their Application to the Vibration of Ships. By Dr. L. Gumbel.

17. Load Extension Diagrams Obtained Photographically with an Automatic Self-Contained Optical Load-Extension Indicator. By Prof. W. E. Dalby, M. A., B. Sc.

The annual dinner of the Institution was held on Wednesday, March 27, at 7:30 P. M., in the Grand Hall of the Connaught Rooms.

Practical Application of Marine Producer Gas Power Plants

The reduction of cost in the operation and maintenance of the power plant of every type of craft engaged in commercial service is of great importance, and some of the installations which have been made in the past twelve months where producer gas is being employed will undoubtedly show the progress which is being made along these lines. The operation of producers on shipboard under the most trying and varying conditions has demonstrated beyond question their ability to meet the most difficult conditions, and one which accentuates this feature very clearly is that described in the following:

The cultivation, propagation, catching and shipping of oysters is a large and important industry extending from the

due to the lighter weight of the producer plant, its greater compactness, and the smaller amount of fuel required to operate the same distance as was formerly done with steam. This holds true of all steam-propelled boats, and is a factor which cannot be overlooked by an owner desiring to obtain the maximum efficiency out of his equipment. Work on a still larger boat of this type is under way, calling for a 250-horsepower plant of the same make and type.

From the above figures, which are not theoretical calculations, but have been proved in actual daily service, the net returns in this field to the owners of this type of boat are sufficient to insure a comfortable income independent of what-

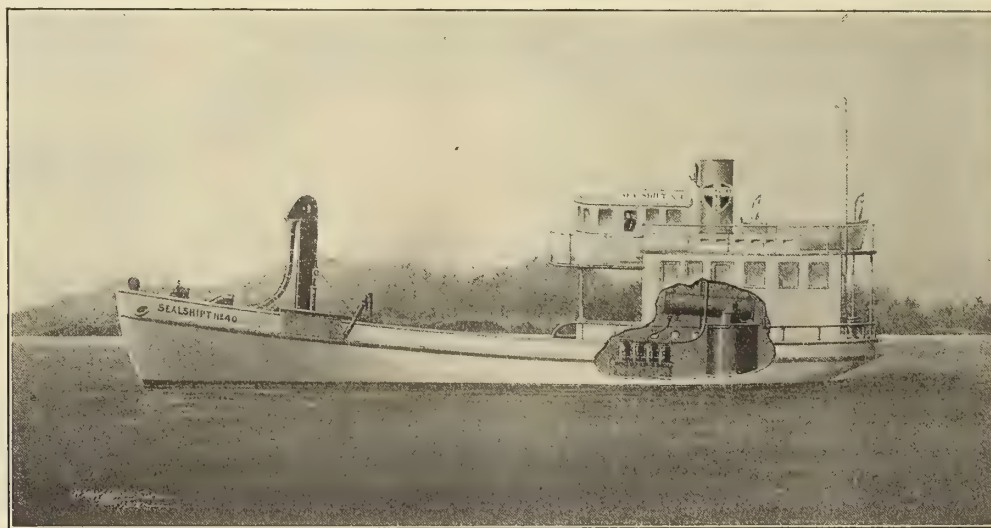


FIG. 1.—PRODUCER GAS OYSTER DREDGE

New England coast into the Gulf of Mexico. Thousands of men are employed in it, and the oyster boats, a very large proportion of which are propelled by gasoline (petrol) engines, comprise a fleet which runs into large figures. In these boats the motor not only propels the vessel but it is geared to hoists which operate the dredges. When the boat reaches the oyster beds the motor is slowed down to about one-quarter to one-third speed, the dredges are thrown overboard and dragged over the beds slowly; after a short interval (the length of time depending on whether the ground is thickly or thinly covered, one dredge is raised by throwing in a friction on the drum hoist, and after the dredge has been pulled in over the rail the friction is thrown out and the oysters are deposited on deck. The dredge is then lowered over the side and the other dredge raised, this alternate raising and lowering of dredges continuing during the day. It will easily be seen that this causes a very uneven load on the motor, the load varying from one-quarter power to full power instantly. After the desired number of bushels have been raised the throttle is opened up and the boat driven at full speed to the discharging station.

Fig. 1 shows an oyster dredge, 66 feet long over all, 22 feet beam, 6 feet 3 inches draft, which is being equipped with a 150-horsepower producer-gas plant. The engine will be a four-cylinder, four-cycle reversing engine, 12 inches bore, 18 inches stroke. This boat was formerly propelled by steam, but the economies obtained in smaller boats which have been equipped with producer-gas power indicate that the substitution of producer gas for steam power will reduce the fuel consumption to about one-third that of the old and smaller steam equipment. In addition to this it is found that the carrying capacity of the boat will be increased not less than 50 percent,

ever the boat may do as a bread winner as she is powered at the present time.

Coastwise schooners of almost every conceivable size are frequently handicapped by their inability to make port under adverse weather conditions. Their value as cargo carriers would be greatly enhanced if their time of arrival at, and

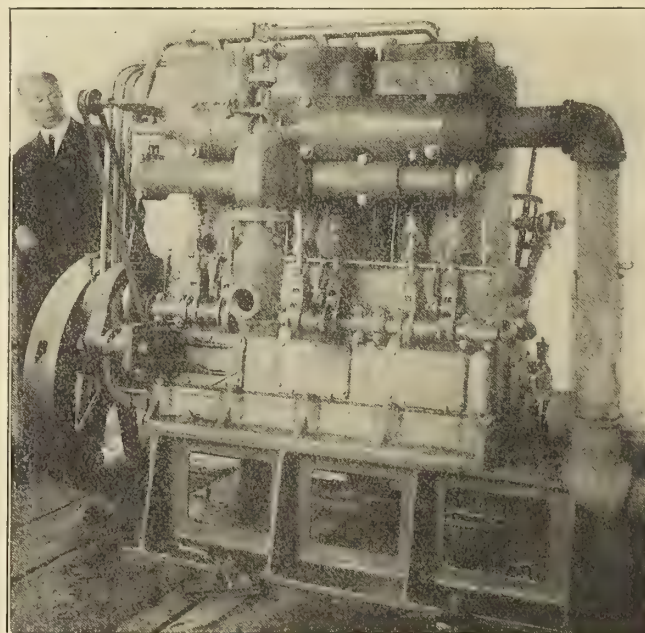


FIG. 2.—75-HORSEPOWER WOLVERINE ENGINE FOR PRODUCER GAS INSTALLATION

departure from, port could be established by using a power plant which would, to a large extent, eliminate the uncertainties of wind and weather conditions. This feature is well known to the coast trade, but the question of securing an auxiliary source of power which will prove reliable and economical is one which has been hard to find.

Fig. 3 illustrates a three-masted schooner, 109 feet long over all, 22 feet beam, 7 feet draft, which plies between Miami and Key West, Fla. This schooner carries freight and a few pas-



FIG. 3.—PRODUCER GAS AUXILIARY SCHOONER

sengers between the two ports mentioned, and was formerly equipped with a 50-horsepower four-cycle motor. Recently this engine has been removed and a new 75-horsepower, three-cylinder, four-cycle heavy-duty engine installed. As the new engine was run on gasoline (paraffin) before the producer plant was placed aboard, a splendid comparison of operating cost was obtainable under precisely the same conditions. The fuel costs given in an extract from a letter from the manager of the line were thus obtained under normal every-day conditions:

"We have always sent \$65 (13/10/10) worth of gasoline



FIG. 4.—PRODUCER GAS-DRIVEN RIVER BOAT

(petrol) to make the round trip, and we sent instead this trip \$10 (2/1/8) worth of coal."

As this vessel makes two round trips a week it can readily be seen that the difference in cost of operation between gasoline (petrol) and producer gas amounts to over \$100 (20/16/8) a week.

The light-draft river boat shown in Fig. 4 is 114 feet long over all, 23 feet 2 inches beam, 3 feet draft, and is equipped with a 75-horsepower producer plant. This boat will be used in carrying freight and farm produce on the East Florida canals. As an example of an economical freight carrier she will be unique, and further details regarding her operation, including the cost of fuel, etc., will be given at some later date.

These are merely cases cited at random from the large and increasing number of craft equipped with producer gas, and all indications point to a very lively interest by the public

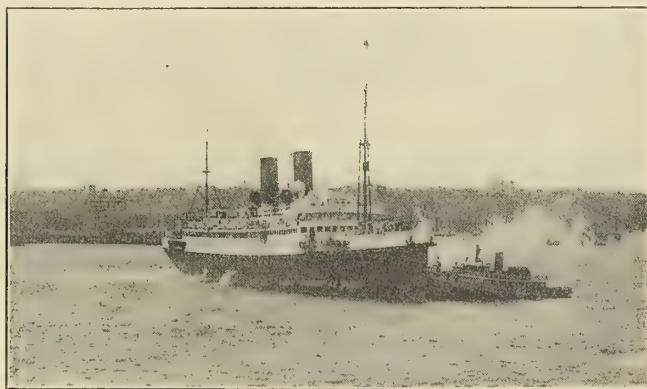
whose business is identified with water transportation, as it presents an opportunity for increasing the earning power of an investment by an economical, simple and reliable source of power.

Steamship Espagne for the French Trans-Atlantic Service

The new steamship *Espagne* has been added to the French Line's fleet. Her general dimensions are as follows:

Total length	561 feet.
Length between perpendiculars.....	539 feet 4 inches.
Breadth (outside plating included).	60 feet 9 inches.
Depth to upper deck.....	38 feet 9 inches.
Total displacement	13,700 tons.
Draft	23 feet.
Gross register tonnage.....	11,155 tons.
Indicated horsepower (per contract)	14,000 horsepower.
Speed	19.5 knots.

The hull is of Siemens-Martin mild steel, and the upper work of high-tensile steel. She is double-bottomed nearly her entire length. She can carry 1,461 tons of water. She



FRENCH STEAMSHIP ESPAGNE

is divided into fifteen watertight compartments and has six decks, four of which extend from end to end of the vessel. The third 'tween deck is devoted to the cargo and bunkers, parcel and mail rooms, safe and passengers' luggage. This latter is accessible at all times during the voyage. On this deck are the store and provision rooms and the refrigeration rooms. The second 'tween deck is devoted to third class steerage passengers, the crew, etc. The forward deck of the first 'tween deck is set aside for first class passengers, the after part to second class. On this deck, alongside the boiler rooms, are the gallery and petty officers' rooms. On the main deck is the forecabin, 56 feet 7 inches in length, in which is located the hospital, infirmary, etc. The central part of the deck is devoted to first and second class passengers. The dining saloon has a seating capacity of 142. Tables to accommodate from two to ten persons are provided. The decorations are the Spanish style of the eighteenth century, ornamented with profusely carved dark wood and fine pictures. The second class dining saloon is the Louis XVI. style, and seats sixty-four people. The space between the first and second class dining rooms is divided into staterooms.

The promenade deck has a length of 427 feet. The forward deckhouse contains four cabins-de-luxe, most luxuriously fitted up, consisting of bed-room, drawing-room and bath. A large first class social hall is provided, being 39 feet 4 inches by 36 feet, in the Louis XVI. style. This saloon provides sixty seats. It is beautifully lighted electrically. In the center of the main deckhouse is provided officers' accommodations and the wireless station, together with the operator's stateroom

A conveniently situated and beautifully decorated smoking-room is provided for each class of passenger. There are eight cabins-de-luxe, 119 first class staterooms, 35 second and 16 third class and 8 large steerage passengers' rooms, the total carrying capacity being 302 first class, 106 second, 90 third and 916 steerage. Thermostats regulate the ventilating apparatus and steam heat, and electric lights are provided throughout. The cabins-de-luxe are fitted with electric radiators and fans, which are under control of the occupants. The ship will carry 5,270 tons of cargo and 2,990 tons of coal.

Her boilers are twelve in number, of the cylindrical marine

type, 15 feet 8 inches in diameter and 10 feet 11 inches long, with three furnaces, each of the Gurley pattern. They carry 200 pounds of steam, the grate surface being 743 square feet and the heating surface 31,290 square feet. The main engines are two in number, of the triple-expansion four-cylinder type, of the following dimensions in inches: 33.5, 54, 67 and 67, with 59-inch stroke. They are designed to give 7,000 indicated horsepower at 90 revolutions. The speed is 20 knots.

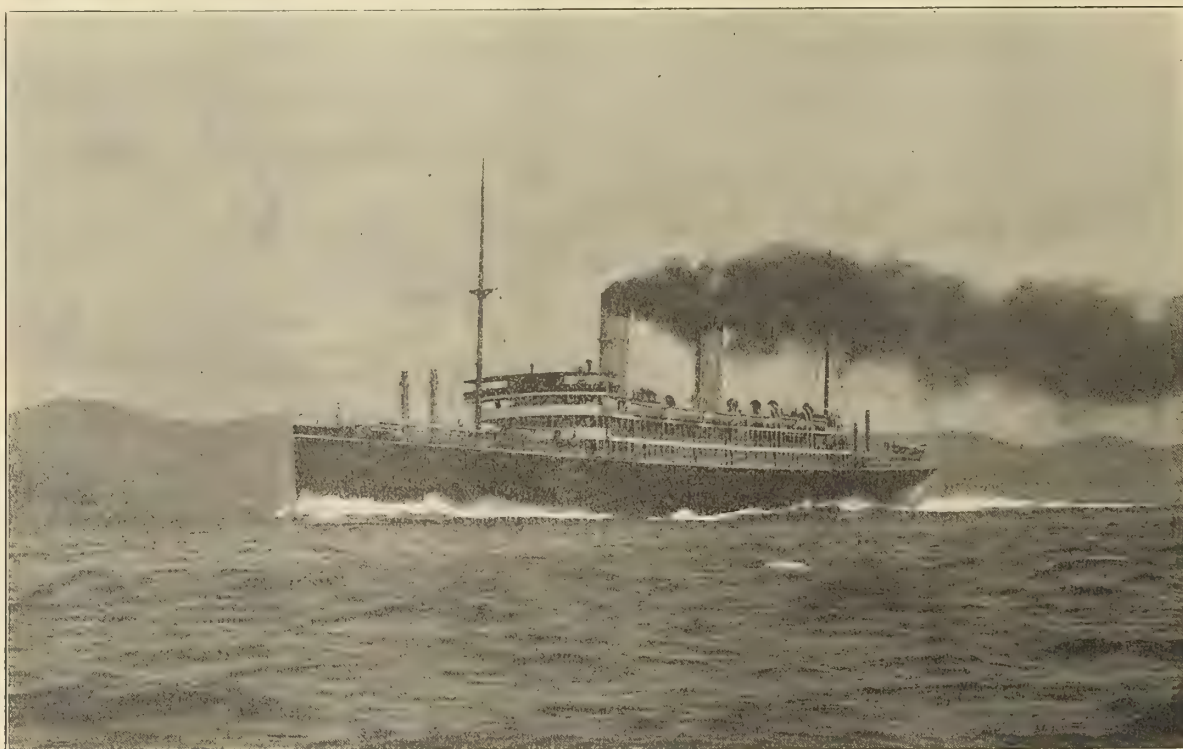
This ship is one of the best products of the Société Anonyme des Chantiers & Ateliers de Provence of Port-de-Bouc and Marseilles.

Japanese Turbine Passenger Steamship Shinyo-Maru

When the Toyo Kisen Kaisha gave the order for three 13,500-ton passenger steamships, capable of steaming 19 knots and driven by turbine engines, to the Mitsu Bishi Dockyard & Engine Works, Nagasaki, considerable astonishment was expressed in shipping circles, and the result was awaited with much interest. Two of the vessels, the *Tenyo-Maru* and the *Chiyo-Maru*, have been in service some time, and are regarded as among the most comfortable liners on which to cross the Pacific. Recently the third, the *Shinyo-Maru*, left

cannot be heard with the ear. This is the first sounding instrument of its kind to be introduced on trans-Pacific ships. The dimensions of the vessel are as follows:

Length	575 feet.
Breadth	63 feet.
Depth up to D deck.....	38 feet 6 inches.
Depth up to C deck.....	46 feet 6 inches.
Height between B and C decks....	9 feet.



SHINYO-MARU

Nagasaki on her maiden voyage, but without passengers, the scheduled trip beginning at Kobe. The turbines of the *Tenyo-Maru* and *Chiyo-Maru* were made in England, but those of the third vessel are the product of the Mitsu Bishi Company, which possesses the patent rights in Japan for Parsons' turbines, and to that extent the *Shinyo-Maru* is more completely Japanese than her elder sisters.

The new boat is double-bottomed throughout, with ten watertight bulkheads and numerous watertight doors, automatically arranged so that all or any one of them may be instantly closed from the bridge. The wireless apparatus has a working range of over 3,000 miles, and an automatic sounding apparatus is fitted which enables the navigator to find his position in thick fog by picking up land noises and bells that

Capacity in Tons—

Gross	13,377.38
Displacement	21,600
Cargo capacity	9,262

Accommodation—

First class.....	210
Second class.....	57
Third class.....	754

1,021

Speed attained on trial trips..... 21 knots.

The bulk of the cabin space is devoted to first class re-

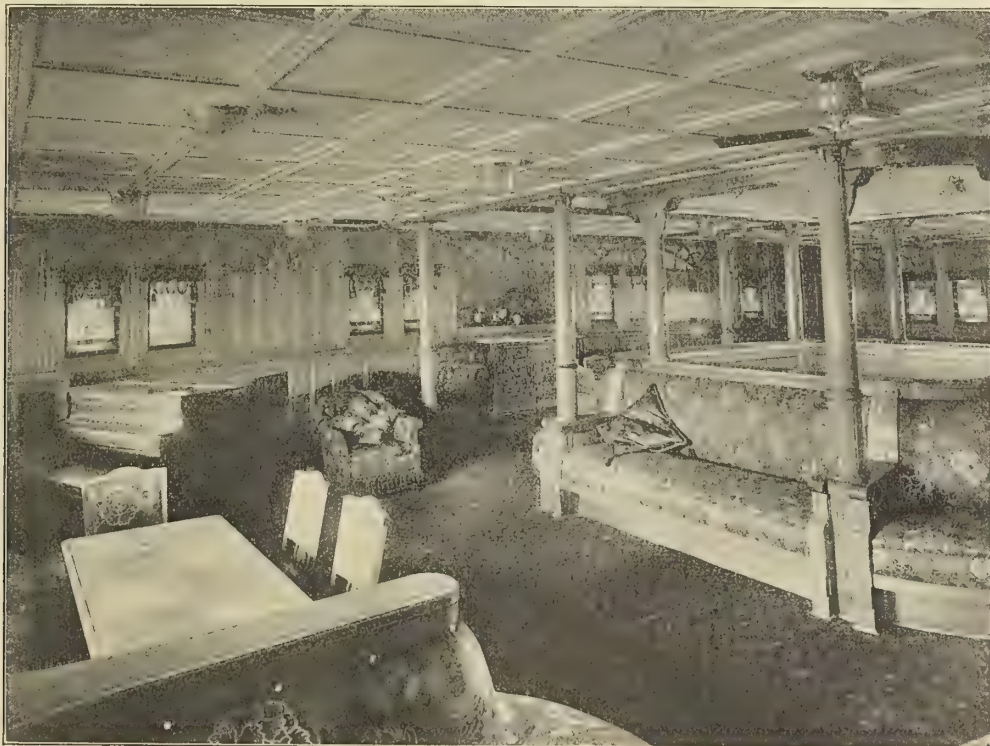


OBSERVATION ROOM

quirements, and no trouble has been spared to make the traveler comfortable. All the latest inventions and innovations have been applied and the furnishing has been done in excellent taste, both comfort and health being studied. The berths were made by a London company, and are more roomy than those usually found on steamers. An electric reading lamp is attached to each berth in addition to the usual cabin lights. For wealthy travelers or invalids two suites of rooms are provided, each consisting of a sitting room, bedchamber

and bath. Electric fans cool and ventilate each cabin, and there are heating arrangements for use in winter.

The first class dining saloon, as is usual with the latest type of ocean liners, contains only small tables, each seating six or eight persons. It is a commodious and well-ventilated apartment with windows opening onto the C deck. The grand stairway entering into the saloon is decorated in magnificent style. A large brocade panel forms the principal decoration, the subject being Cherry Blossom, significant of the spring and



LOUNGE

emblematic of the steamer's name *Shinyo*, or *Spring Ocean*. Immediately above the dining saloon is the drawing room, which is decorated and upholstered in excellent taste. It abounds in easy chairs and cosy corners. On the same deck are the writing-room, the lounge and the smoking-room.

On what is known as the A deck—the boat deck—there is a palm house, with beautiful palms and ferns, forming a pleasant observation saloon. Arrangements have also been made for passengers to dance and swim if they wish to do so—a space being left on the B deck for dancing and a swimming tank of large dimensions being placed forward of the dining saloon.

The second class accommodation is on the D deck. The cabins are very fine and even better than are found on many first-class steamers. The smoking-room and dining saloon are elegantly furnished for the comfort and pleasure of passengers who desire to travel at the cheaper rate. On E and D decks are the accommodation for steerage passengers. These quarters are exceptionally neat, clean and well ventilated.

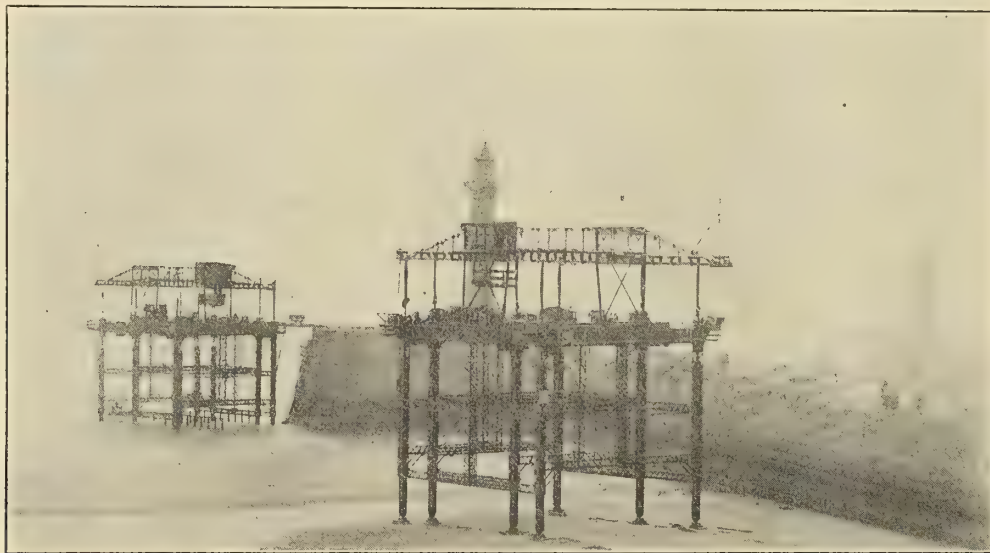
For handling freight the vessel has been well equipped for

deduction. The total tonnage deducted under this head is 210,031 tons higher than the similar figures of 1910.

Locomotive Marine Stages

The problem of carrying on work in a rough or smooth sea without delays and loss due to disturbing influences has been solved in an interesting way in England, where there has been in successful use for more than a year a form of locomotive marine stage invented by a civil engineer of Scrubwood, Wendenover, named Robert A. A. S. Piercy. The first of these stages was tried at Peterhead, Aberdeenshire, where it was employed with great success in removing a ledge of granite that extended across the entrance to the harbor and endangered the vessels of the fishing fleet at low tide and during storms. Ten thousand tons of rock were blasted and removed with the aid of the locomotive stage. Two similar stages are in use at Whitby harbor and one at Dover.

The means by which mobility is obtained is ingenious and of great interest. The staging consists of two principal mem-



MOVABLE STRUCTURES USED IN HARBOR ENGINEERING WORKS

loading and discharging cargo. She has twelve hatches, six derricks with twelve booms, also twelve 4-ton winches. The two foremost posts and booms are built for heavy cargo, having a lifting capacity of 25 tons each.

The total addition of steam tonnage to Lloyd's Register of shipping in the United Kingdom during 1911 has been 1,334,387 tons gross, and of sailing tonnage 21,864 tons gross, or in all 1,356,251 tons gross.

Of the tonnage added to the Register about 92¾ percent consists of new vessels, practically all built in the United Kingdom. The largest item among the other additions to the Register are those of vessels bought from foreign countries for the United Kingdom, viz., 82,757 tons.

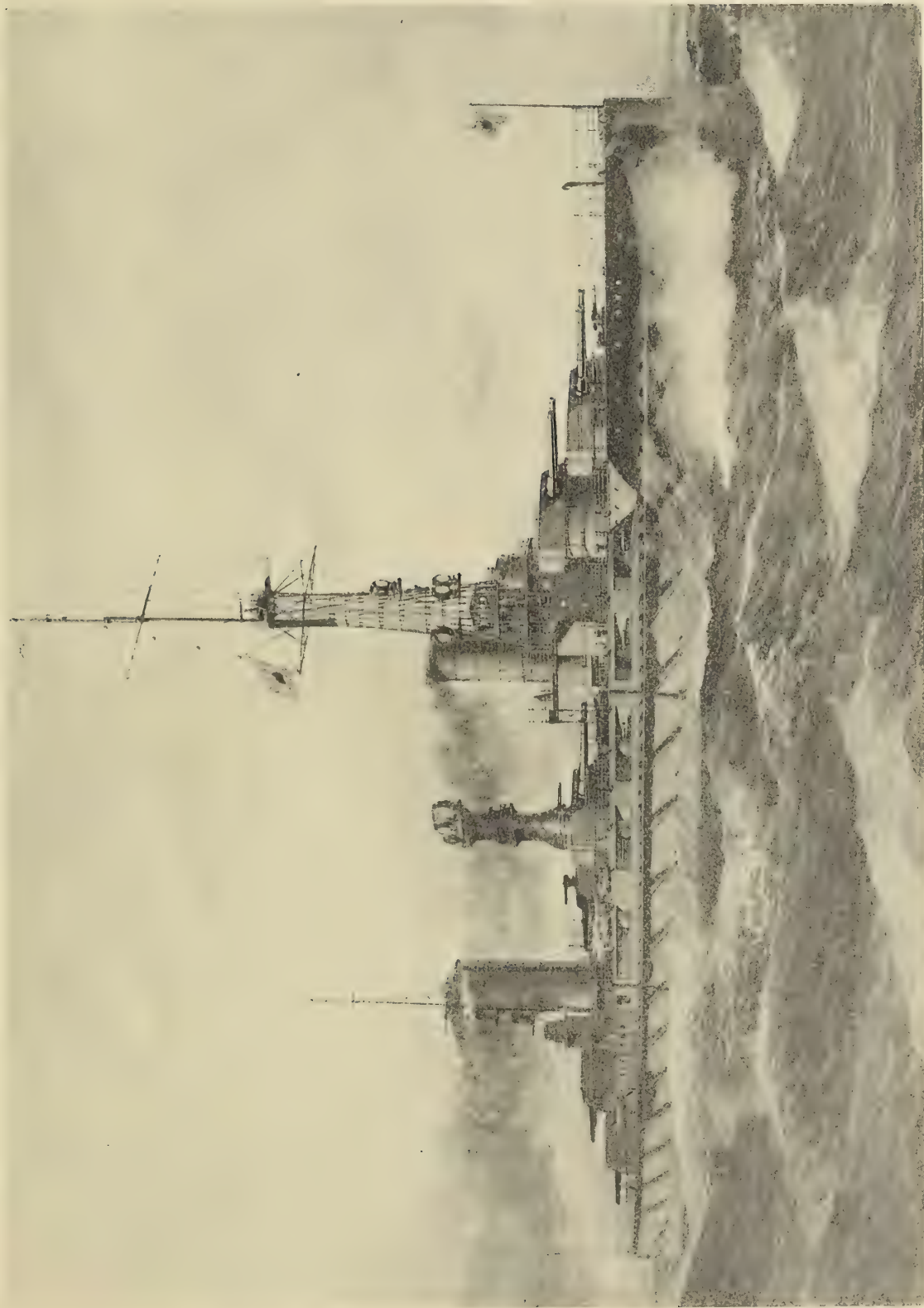
The gross deduction of steam tonnage from the Register amounts to 854,483 tons, and of sailing tonnage to 163,551 tons, or in all to 1,018,034 tons. Of the steam tonnage nearly 24 percent and nearly 26½ percent of the sailing tonnage included in these figures have been removed on account of loss, breaking up, dismantling, etc.

The tonnage sold to foreign owners during 1911, which, however, includes a considerable amount intended for breaking-up purposes, is returned at the record figures of 730,485 tons. The steam tonnage deducted on this account is 616,546 tons, and the sailing tonnage 113,939 tons, or over 72 percent, and about 69½ percent, respectively, of the gross

bers, both of truss or bridge construction. One is considerably smaller than the other and is placed inside of it, as shown in our illustration. Each of these is supported by four vertical legs or spuds of Oregon spruce, 80 feet in length, placed at each of the four corners and enclosed by a truss column. The columns are tied together by horizontal trusses, giving both the outer and inner structures independent rigidity in all directions. The spuds work in guides, and are capable of vertical movement, each independent of all the others. Means are employed for raising and lowering the spuds. When the four spuds of the inner structure are raised clear of the bottom the entire weight of the stage is supported upon the four spuds of the outer structure, and vice versa.

By suitable means, not shown, the bridge carrying the inner structure can be moved longitudinally of the outer structure after its spuds have been raised. Its entire weight then rests on rollers that travel on the upper track portion of the second structure. When it is desired to move the outer structure its spuds are elevated until the weight of the whole stage is carried by the spuds of the inner structure, when it can be advanced upon the rollers upon which the lower track portion rolls.

If the nature of the work to be done is such that radial motion is very desirable, the side members of the outer structure can be bent to the arc, so that the movable bridge can turn on its center like a turntable.



ARGENTINE BATTLESHIP RIVADAVIA, OF 26,500 TONS DISPLACEMENT, UNDER CONSTRUCTION AT THE FORE RIVER SHIPYARD, QUINCY, MASS.
(For complete description, see INTERNATIONAL MARINE ENGINEERING, May, 1910, and January, 1912.)

An Air-Reversing Propeller

While the air reversing propeller is not a new idea, that designed by L. H. Coolidge, marine architect and engineer of Seattle, Wash., for the barkentine *Archer*, which has been fitted with a marine producer gas installation, is not only the largest yet cast, but it combines a number of new features. One feature of this big propeller, which is 82 inches in diameter, with maximum pitch of 82 inches, is that a center is used that never before has been brought into play. This propeller has been designed and cast with an extreme nicety as to detail. The workmanship on it is practically perfect. The trunnions have been protected with jib blocks. Every bit of space has been cared for and each recess is nicely machined out, perfecting a nice working fit. Another difference in this particular propeller is that the propeller is carried on the covering bushing, which is four feet long and $\frac{1}{2}$ inch thick, boshed up to one inch at the after end. It lies in lignum vitæ. The bushing is riveted and boshed up and the hub is put on with threads and three keys.

The wheel is carried on a $6\frac{3}{4}$ -inch steel propeller shaft, on the end of which is fitted a triangular bronze fitting having recesses which engage the trunnions on the roots of the propeller blades.

The hub is cast in two parts, the forward part being carried on the bronze casing, which extends through the stern tube into the vessel and has yokes and collars at the inner end to which the plungers from the air cylinder and dash pots are attached. This casing is movable fore and aft over the pro-



COOLIDGE AIR REVERSING PROPELLER

peller shaft by means of compressed air, admitted to the cylinders on either end of the pistons. The air control levers are mounted on a standard which is situated near the throttle of the engine so that it can be easily reached by the engineer.

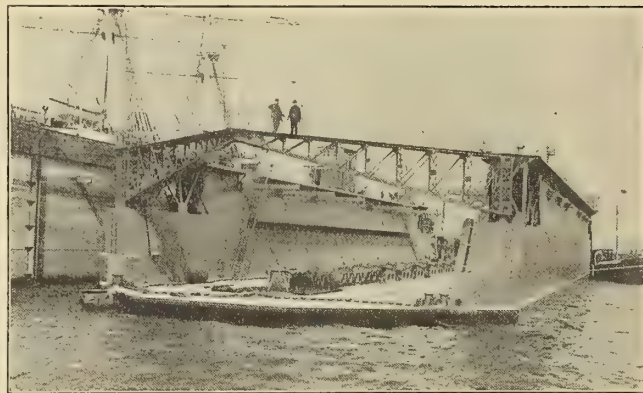
The cap or after part of the hub is provided with an adjustable center by which the desired pitch of the blades is fixed. This center also carries a thrust load to the propeller shaft. The cap or after part of the hub is secured to the forward half with six Tobin bronze studs.

The hub and blades are cast from manganese bronze, while the bushings and minor parts are red bronze. The weight of the propeller is practically one ton. The blades are interchangeable and the vessel carries an extra set, this being thus equivalent to a built-up propeller. Ample bearing surface is provided for the blades and the hub is designed with sufficient strength to withstand without injury anything which would break down the blades. The blades can be handled practically fore and aft. The release clutch is between the engine and propeller, so that the engine can be run without the propeller being in action.

In the accompanying illustration the propeller is shown as it appeared in Mr. Coolidge's office. The markings on the blade shows the cut made by the grinding wheels.

New Floating Dock for Rotterdam

A new double-sided self-docking floating drydock, 365 feet long and 81 feet wide, has been built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., for the Wilton Engineering & Slipway Company, Rotterdam. The dock is of the type known as the bolted sectional dock, and was designed by Messrs. Clark & Stanfield, of Westminster. This dock combines the advantages of the great longitudinal strength of the box type with facility for self-docking. The dock is built in three



SECTIONAL FLOATING DRYDOCK FOR ROTTERDAM

sections, which are bolted together, and are disconnected only when self-docking is required. Any two sections of the dock can lift the third section to a height sufficient to allow barges and workmen to pass underneath. Electric-driven centrifugal pumps are used, independent sets being furnished for each section of the dock.

Steamer for West Indian Trade

About the end of November Messrs. Russell & Co. launched from their extensive yard at Port Glasgow, Clyde, the screw steamer *Crown of Toledo*, for the Clyde and West Indies service of Messrs. Prentice, Service & Henderson, of Glasgow.

The dimensions of the *Crown of Toledo* are: Length between perpendiculars, 455 feet, 56 feet 3 inches beam, extreme, 39 feet molded to shelter deck. Her gross tonnage is 6,100 tons, and she has been built to the highest class in the British Corporation Registry to secure a full Board of Trade certificate for passengers. The masts are the latest type of twin masts, forward and aft, for the purpose of carrying a large number of derricks for rapid cargo handling. There is a complete installation of electricity throughout and all the fittings are first class.

As Messrs. Russell & Co. are not engineers the machinery is supplied by Messrs. Dunsmuir & Jackson, Govan. The propelling engines have cylinders 28, 46 and 77 inches by 54 inches stroke. There are four boilers, each 15 feet by 12 feet, designed for 180 pounds working pressure. There are three furnaces in each, 3 feet 8 inches diameter inside, of Deighton section Stephen & Gourlay ends, fitted with Howden's forced draft.

Among the auxiliary machinery are eleven steam winches of Clarke, Chapman & Company's latest Cyclops pattern, and windlasses, also by Clarke, Chapman & Company, of the direct-acting grip type. The steam steering gear, by Caldwell & Company, is fitted aft, and is controlled by telemotor gear. The pumps are of Weir & Company's make.

Communications of Interest from Practical Marine Engineers

Incidents Relating to the Design, Care and Handling of Marine Engines, Boilers and Auxiliaries; Breakdowns at Sea and Repairs

Weak Points in Steamship Design

Common sense is as great a necessity in marine engineering and shipbuilding to-day as it ever was. "A" says put in a condenser of so many square feet of cooling surface to take care of the steam from such and such size engine. Now "B" orders a ship of the same dimensions and power, but a different yard builds it, and they say, "How many square feet of condensing surface did Mr. "X" put in that boat," and as soon as they find out, Mr. "Y" puts in one of the same dimensions. There may be a change of detail, but the same blessed number of square feet is there, and so are the same troubles. Oil in the boilers? Why, of course, that is where it should go, so that the cost of an extractor can be saved; and again, oil gives no trouble on a drawing. Feed-water heater? Yes, have one by all means; there is bound to be a saving. Take the steam from the receiver or boiler and throw the exhaust from the auxiliaries into the condenser. That is where the saving comes in. Evaporator? What use is an evaporator, anyhow; there is plenty of water in the ocean, and you can blow down. Steam separator? All nonsense; there is room between the rods and packing for water to leak through, and what are relief valves for, anyhow? Only an ornament. What is the coal pile for if not to use as much of it as you desire?

Poor Mr. Engineer, these things are nothing to you. What if your crown sheet comes down, and you lose your ticket? There are others. And again, time in the drawing room is more important than wasting it by trying to analyze a problem as it should be. I have in mind the chief engineer of a prominent shipyard who, if he saw you computing anything, had a fit of several hours' duration. You were expected to copy from other drawings and say: If $x = 1\frac{1}{2}$ inches and $y = 3$ inches and you want to know V_1 from the V on the other engine, then all you have to do is to perform a parrot stunt, and say 1.5 inches is to 3 inches as V is to V_1 . When you have finished this rot, you have an engine that looks like the deuce, and which you are expected to modify by eye. Talk about scientific design! The world is full of it. But to get back on the track of our trades.

First consider the separator. Think what it would save in one year. Now take the practice of fitting an automatic valve to the well of a separator and let it dump into the filter box. Oh, is this not joyful, when we can pipe right from the well to an auxiliary or auxiliaries having no flywheel, for they can run on steam of dryness factor of .70 as well as not? Right here is a point of economy. What a saving on packing; what a saving on relief valves, and what a saving on nerves! A separator is one of the most important factors of economy; and how much better the old mill works on steam with a little less water, and how much better the indicator diagram looks. You feel as though there was a safety-gate between you and eternity.

Next we come to the grease extractor. Is it not fine to come into port, and, after cooling down the boilers, get into them, and see the total absence of grease, and see the surface just salted to the proper point? Then you come out, feeling just fine, and knowing that there is no sign of corrosion or pitting; and then you go over the feed line, filter box, etc., renewing the burlap in same, and thinking that now you do

not have to depend on those and the product of the farm. Straw is good for some things, but not for others. You look over your cartridge, and perhaps you have to renew one in the extractor; but, pshaw! this is a pleasure. You look at your heater and that is clear.

Next comes the heater. Why be satisfied with an evaporation of 8 pounds of water per pound of fuel when you can just as well evaporate 10.5 to 11 from and at 212 degrees if you get the proper temperature of feed to start with? Then your auxiliaries are sending their waste heat, to a place where it counts, and you are showing the owners results. What is your saving? Why, 1 percent for every 10 degrees. You are getting steam without any trouble, and when you come into port your log shows a fine run and small coal consumption. How do you feel? There is no need to ask, the results are evident.

Now your evaporators need looking over. Well, they have worked well on the run; they have given the extra feed, and they have required very little attention; the density has been kept proper, and the coils are very little coated. And, by the way, boys, I have a pump that is designed for the work, and you do not have to stand with a microscope to see if it is running. This pump is not too large, neither is it small; but at a decent number of strokes or double strokes, you can see it moving, and need not wonder if the confounded thing has shut down and you have the warning from another source. Then, again, I can get that water through at the proper temperature, because it is designed properly, and altogether I am happy. What is the saving? Well, boys, some day I am going to take you out for a walk, and I am going to take two conditions and show you the saving in good plain English—no calculus, nor any juggling of figures—but the plain log-book talk. Now that we have all of these, is it not fine to indicate our engines and get our valves where we want them, and see the fine steam line, the fine compression curve, and get a noiseless engine, and one in which we have the work as nearly equally divided as it is possible to get it?

Engineers, listen! This is up to you. It is up to you to go to your owners, and to protect their property and your own lives and nerves. You will never get it out of the drawing room, for they are going to give you as little as is possible. It is their pleasure and privilege to forget the thing as soon as it is out of their hands and to sit by a warm fire at night and read, while you, who are out on the stormy billow have it all to look after and keep up. I say that the sea-going engineer has got to assert himself, and he can be a great factor in the proper design of ships and engines, and it is his duty to do so. The owners are, as a rule, business men, and why they do not insist on having all that goes for economy is beyond me. I need not call your attention to the ships running to-day that are simply coal eaters; and why? Because they will not install saving appliances; and again why? Because they won't listen, and permit you to prove to them what you can do. A naval architect and marine engineer should insist upon installing everything that he knows is good, and which will show a saving compatible with the expense of the installation; but some of them don't know, others don't care as long as they get the commission to design something that makes a noise like a steamship, boat, or other floating object.

Now here is Mr. "A." He is a fine engineer, and has been to sea longer than I have; and as I have the commission to design this steamer I am going to have a talk with him, as he is going out as chief of her when she is built. I go, and have my talk. I learn the weak points of his present ship, and I learn many things as I talk; and, as my design takes shape, I call him in and say: "Mr. 'A,' there is the design; have you any suggestions to make"; and perhaps he has, and I discuss them with him. I tell him I am going to design the engine, thus and so, and give him plenty of room. I am going to cut away from this grand and noble thing called shipyard practice, and I am going to make all my main bearings longer than this so-called practice, and I am going to design my bed-plate so that I won't have a rocking-horse such as this good old shipyard practice produces, and I am going to reduce all clearances, and use piston valves—not plugs, you understand—through which you can see daylight when they are cold; and I show him that I have designed the guides, which are of the all-round type, so that there is no deflection, because I have spent some time and computed them and designed for stiffness as well as strength, which is not the good old practice. And oh, Mr. "A," lest I forget, I have incorporated a separator on the main steam line, an evaporator, a heater and grease extractor, and my pumps are all designed to take care of working conditions, as well as over-load without giving you heart failure. And here is the hull—you see, I have made the engine seating very stiff and rigid. You will note that I have arranged certain details as per your ideas. And, say, they are fine, too. It costs no more, and may even cheapen the cost of construction.

Now, what is the result? I go to the owners, and go over the figures and prove to them, not by hypothetical cases, but by actual results, that their new boat will save them so much more per year and carry freight for less per ton mile than this old ship. What is the result, again? This ship is built and the engineer feels that he is of some moment. He takes great pride in her, and he proves my figures, and by his ability he shows even greater economy than I promised.

Are such men worth having? Is it an impossible condition? I am willing at any time to prove that it is a true condition, and even underrated than otherwise. Please remember that it is one thing to build cheaply and have an expensive ship and lose money, and another thing to go to a little more expense in installing proper appliances in a ship and making her a money-maker. There is still another thing; let us have bright, thoughtful knowledge-seeking engineers, and remember they are the boys that, with proper means, can show results; and they, as a body, are only too anxious and willing to show their ability. I admire them; I have been one of them; and if their advice was taken many a failure would have been a success.

There is in the average shipyard a feeling of contempt for the sea-going man—and justly so, because when a sea-going engineer is selected to superintend construction, they know he will insist upon having certain things. I know several inspectors who are sea-going engineers, and they have been handicapped by the builders, and even by letters written by the shipbuilding company, about their inspector, but in every case the owners have upheld him. I can point to one case in particular, and the work shows how faithfully he performed his duty; and I can say while he had his trouble, his work speaks for itself, and the performance of the boats are up to expectations. Let us as naval architects and marine engineers welcome the assistance of the practical engineer, and have his confidence, and get his views, and I guarantee that his assistance and suggestions will not only react to our credit as professional men, but to the advantage of those who employ us to do their designing.

CHARLES S. LINCH.

Between the Engine and the Propeller

Every one who has gone down to the sea in ships as a marine engineer will know that a good proportion of his trials and tribulations have occurred in the region between the engine and the propeller. Whether he be a Scotsman or not he will always regard the shaft tunnel with an air of cautious reserve, and he will never be persuaded to take the thrust block into his confidence as a bosom friend. Things are far too likely to happen there, particularly if the vessel is at all cranky and throws sudden and unexpected stresses upon the propeller shaft and its belongings.

Here is a little incident which may illustrate the force of these remarks. While a vessel was working its way through the Bay of Biscay in weather which would not have suited a Cook's tourist it was noticed that one of the couplings on the propeller shaft seemed a good deal looser than was consistent with the safety of the vessel. The engine was stopped and the engineers set to work to tighten up the coupling bolts

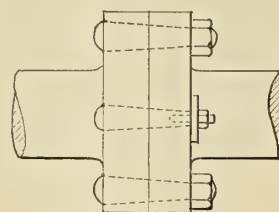


Fig. 1



Sternway
White Metal
Fixed to Shoe

Fig. 2

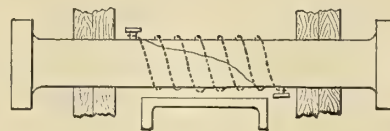


Fig. 3

with a key and a quarter-hammer. One of the coupling bolts must have been very badly strained, for when pressure was applied in the manner mentioned the nut and the screwed end came away suddenly, the broken end showing a rather crystalline but quite a clean, new fracture. This was a predicament which had to be faced pretty promptly, as the vessel, having no way upon her, was properly in the trough of the sea. An attempt was, of course, made to drive out the shank of the coupling bolt to put in a spare one, but it was far too tightly wedged in for such simple measures to be taken. There was, of course, no time to drill the faulty bolt out, so that the temporary measure shown in Fig. 1 was adopted. An inch tapping hole was drilled about 4 inches down into the bolt, and after the hole had been tapped a stud was put in and forced tightly home. In the meantime a large washer had been made out of a piece of boiler plate. This was slipped over the end of the stud and a nut was screwed on as tightly as possible. In this way it was reckoned that even if there was a tendency for the stud to work loose and drop out when the engines started to run again this would prevent it, and as a matter of fact this makeshift repair carried the vessel through until the next port was made, when the broken bolt was drilled out and a spare one inserted in its place.

Another little incident which is not without its peculiar

interest may be related. In one ship which traded between Great Britain and the United States it was found that there was not sufficient engine oil in the stores to carry the engine home to its British port, and some more oil was ordered in the American port of call. This oil did not recommend itself to the engineers on its arrival, as it was very thick in appearance. No aspersion is here cast upon American oil, as good oil can be got in the States as in England, only it happened that the engineers struck a bad streak of luck with this particular consignment. As they were very doubtful about it, and as it was too late to change it, they came to the resolution to use it first of all upon the thrust block and see how it went on before they used it on the whole engine. They were afterwards very sorry that they used the thrust for experimental purposes; they wished it had been a donkey pump. They put the oil into the thrust at 6 o'clock at night, and it seemed to work all right. The thrust block had a continuous flow of sea water through it, which, of course, helped matters considerably, and no heating whatever was perceptible. About 3 o'clock next morning, however, the third engineer, who was on watch, awakened the first out of a deep and virtuous sleep to inform him that matters of interest awaited him in the engine room. By the time he had got there the main bearings of the engine were getting uncomfortably warm, and one of them was sparking. This was due to the fact that the engine shaft had worked forward because the white metal liners of the thrust block shoes had simply been ground away for an eighth of an inch. The group of sketches in Fig. 2 will explain the arrangement which was in trouble. On the headway side of the thrust block shoes there were white metal loose liners, supported on three studs, as shown, while on the sternway side the white metal was fixed to the shoe. When the engines were stopped and the thrust blocks taken out it was found that the oil-ways shown in the sketch were gone altogether, and the headway liners were hanging loose. These were therefore taken off and new oil-ways were cut in them. In order to make up for the lost thickness mentioned above some iron liners $\frac{1}{8}$ inch thick were made and placed on the studs behind the white metal ones, being cut and drilled to the same dimensions as the white metal. This effectively took up the wear. Then the thrust block and oil boxes were thoroughly cleaned out before the shoes were put back, and a change back made to the kind of oil which had been used on the outward trip, it being resolved that whatever part of the engine had to make out with the new oil it should not be the thrust. As a matter of fact the new oil was far too thick and clogged up the oil-ways, and when some of it did get down to the working surfaces it could not stand the pressure upon them.

It is, fortunately for the peace of mind of the marine man, not often that anything so serious happens as the total fracture of the propeller shaft, but it is an eventuality which has to be faced, and it may therefore be not without interest to relate how an incident of this description was coped with. The sketch in Fig. 3 will illustrate the way in which a broken tunnel shaft was repaired. The trouble originated in the bearing, this becoming weak because it frequently got hot and was cooled out again too suddenly by passing sea water through the water-service pipe. This heating of the bearing was in the case considered quite unavoidable, as it was due to the sagging and hogging of the ship when she was loaded and light. The result was, however, that it broke in the bearing, and this immediately resulted in the fracture of the shaft as shown. Fortunately the vessel was not far away from the home port when the accident happened, so that strictly temporary measures were taken. The broken bearing was first of all cleared out of the way, and then the shaft was shored up so as to bring the faces of the fracture close together. The shaft was a steel one, and the alternate cooling and heating had made it quite crystalline, so that the fracture was a very clean one. When the shaft had been brought into posi-

tion wooden steadiments were made out of hatches to take the weight of the shaft. Bolt holes were drilled into the shaft, as shown, and bolts secured to it. Some heavy chain was secured from the deck, and this was wound round and round the shaft, one end being secured by means of a shackle to one of the bolts. The direction of winding was such that when the boat was going ahead the twist on the shaft would tend to tighten the chain on the shaft. It was brought into very tight contact with the shaft in the first instance by using strong chain blocks to draw it tight, and before the tension was released the other end of the chain was secured by a shackle to a bolt in the other portion of the shaft. This was a somewhat unconventional mode of repair, but it answered well in practice, and the ship was brought home safely by running at a little over slow speed, and taking care never to put the engine astern. It may be mentioned in connection with this accident that on examinations of fractures in propeller shafts, except where they occur at the thrust block and near the coupling flanges, it is nearly always found that they assume a diagonal direction across the shaft, and one could think, therefore, that possibly the thrust along the shaft has as much to do with the fracture as has the torsion.

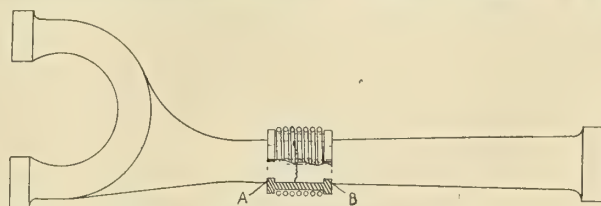
In concluding these brief notes on troubles between the engine and the propeller, there is no intention to discourage the younger engineers, but rather to point out to them what might happen, in order to put them on their guard. The incidents also point to the fact that, other things being equal, the nearer the engine is to the propeller the better it is for the peace of mind of the engineers.

OBSERVER.

Repairing an Eccentric Rod

As my repairs of the coupling, or rather shaft, in your August issue seem to have met with favorable notice, I give a sketch of a repair I once made at sea. In this case, however, a new eccentric rod was put in on our making port.

The break occurred early one morning when the *Santos* was about a day and one-half from our English port. No damage was done when the eccentric rod parted, and as shown in my drawing the break was very clean. I had the "Y" part taken out at once and put in the "machine shop," as it was



REPAIR OF A BROKEN ECCENTRIC ROD

called aboard ship. All there was in it was a lathe (self-acting) and an emery wheel.

The length of the rod below the break was about 4 feet 6 inches. I smoothed up the face of the break and quick-punched the top half, drilling a $\frac{3}{4}$ -inch hole about 2 inches deep in it. I took considerable care to get this hole exactly in the center of the rod and drill its mate in the other broken part so as to have it match.

The long piece was awkward to drill, so I had to take the tail stock off the lathe and block up against the bulkhead, and feed the piece forward for drilling with a small screw-jack. Getting this right in the center was a lot of trouble, and even with all my care the pieces did not exactly match when I brought them together with a pin to hold them, as shown in my drawing.

The feet of the "Y" part were about 10 inches wide from outside to outside, and of course there were holes for the link brasses, and I had no trouble in bolting this "Y" piece by these

feet to the face plate of the lathe and centering it, and with a dog on the drill I could drill the hole with great ease. Before taking the piece out of the lathe I turned the groove *A*, which was about $\frac{3}{4}$ inch wide and $\frac{5}{16}$ inch deep. I put on the back stop (or what they call here a steady rest, but on this point there seems to be a row), to help me steady the work, which stuck out about 14 inches, if I remember right. This part of the work was easy, but I had trouble holding the long piece while I cut the groove *B*.

I turned up a sleeve, which is cross-hatched in my drawing, out of a piece of machinery steel, and it took me about 16 hours to drill through it and run the taper, which I could do on the lathe as it had a compound rest, but I had to reset the tool as my feed was not sufficient. I made an arbor and turned off the outside as shown. The nice part of the work was to get the rings at the end of the steel sleeve to meet the grooves, but after sawing this sleeve apart with a hack-saw, or rather a good many of them, and doing a little scraping, I made a good job of it, and got the half of the sleeves out as shown, and wound the outside with copper wire, and with my heart in my mouth I started up slow, but the mend held, and we got through all right, and although we were considerably late the loss of time and cost of repairs was a great deal less than getting a tow.

COUPLING.

Minor Troubles of the Marine Engineer

Perhaps it is a good thing that all the difficulties which assail the seafaring engineer are not big ones; he might collapse under them. The only thing to remember, however, is that the small troubles, unless taken in the proper manner, are apt to become big ones, and a word or two may, perhaps, be permissible on one or two small points which ought to be and probably are known to every marine engineer who has been taught in the school of experience. As, presumably young beginners read the columns of the *International Marine Engineering* as well as old stagers, perhaps the editor will permit brief reference to elementary matters.

In the simple matter of grinding in plug cocks, for example, there is a right and a wrong way of going about the job. The wrong way will probably lead to a great waste of



FIG. 1



FIG. 2



time, and time is sometimes of importance at sea. All these plug cocks will be found to have hard places which, in the ordinary way, will take a lot of grinding down. One of the easiest and quickest ways of finding these hard places is to chalk down the plug in three places, put it in its shell and give it a turn. Then on taking out the plug and examining it the hard places will be distinctly shown. These portions should be dealt with carefully with a smooth file, and the plug should then be chalked and tried again until all the hard places have been taken off. If this simple proceeding is taken it will be found that the actual operation of grinding can be performed in very much quicker time and much more easily than if the filing had not been done.

Then, again, junior engineers, who flatter themselves that they can make a joint, frequently let themselves in for trouble

by not nursing the joint properly when it is put into commission again. The result is that the joint before long begins to leak again, and the junior gets himself into trouble. Whenever a joint has been made when the pipes are cold it should be remembered that they should be gone round again with a spanner and tightened up as soon as the pipes are warming. It will be found that some more can be got on the nuts no matter how tight they were before. This should be repeated four or five times and the joint will then not get a chance to leak. It is a simple thing to mention, almost too simple to write about, perhaps—but anyone who has monkeyed on with a leaking joint when it was impossible to shut down will know its importance.

There are all sorts of little things about the steam installation on board ship that can hardly be classed as important, and yet they count. It would, perhaps, be unsafe to say that the engineer can be best judged by the way he tackles detail troubles, as this is not strictly correct, but there is no doubt that the man who does look after the little defects is a great source of comfort to the owners of the ship. Sometimes, too, these detail jobs require as much ingenuity as the bigger ones. For example, it was found on one ship that one of the boiler check-valves would not keep tight when it was shut down and when the steam was off the boilers this valve was taken out. It was found to be broken as seen in Fig. 1, and in addition the miter on the valve and valve-seat was found to be in a very bad condition. The reason that the wing broke on the valve was due to the clattering of the valve while it was at work and was probably unavoidable. It may be said in passing, however, that to avoid such troubles, check-valves of this description should be made stronger in the wings than ordinary valves, and another thing which seems to be supported by experience is that valves having three wings are much better in practice than four winged valves, as they are not so likely to "gag" or get forced up and held tightly against the seat. The fact of one wing breaking as shown caused the valve to twist a bit, and this meant that it did not come down on its original seat, and so spoiled the mitering.

As so often is the case on board ship, unfortunately, there were in this instance no spare valves available, so that a minor repair became necessary. First of all the remaining part of the broken wing was chipped off flush with the top part of the valve as shown in the second sketch, and then two $\frac{5}{8}$ -inch tapping holes were drilled close to each other in the head of the valve as shown. They were then tapped and suitable studs were then screwed in so as to form a temporary wing to guide the valve better. When this was done the valve was next ground in and new miters were thus made on the valve and seat, and the parts were then put together. It was then found, on setting the boiler away again, that no more trouble was caused by the valve, and the repair lasted perfectly satisfactorily until a home port was reached, when a new valve was procured.

It may seem absurd to mention such obvious and elementary matters as the above, but the writer is convinced that nine-tenths of the trouble at sea arises from causes which were originally of the most trivial nature, so that nothing in the nature of supervision and repair is too trivial to be worthy of attention.

JUNIOR.

Report of Bureau of Navigation

The Bureau of Navigation reports 72 sailing, steam and unrigged vessels of 14,918 gross tons built in the United States and officially numbered during the month of February, 1912. Forty-four percent of this tonnage consisted of steel steam vessels, the largest being the passenger ship *City of Detroit III.*, of 6,106 gross tons, built on the Great Lakes.

Review of Important Marine Articles in the Engineering Press

Torpedo Boat Soridderen for Danish Navy.—Recently completed by Messrs. Yarrow & Company at their Scotstoun works, this vessel is 181 feet 9 inches long by 18 feet beam and molded depth of 10 feet 4 inches. High-tensile steel has been used in hull, where great structural strength was required. Machinery consists of Brown-Curtis turbines and two Yarrow boilers of the latest type, working at 265 pounds pressure. Armament consists of two 7.5-centimeter quick-firing guns and five torpedo tubes. On trial mean speed of 27.217 knots was obtained for three hours with 4,800 shaft-horsepower. 400 words and photograph.—*Engineering*, October 20.

Twin-Screw Steamer Chelohsin for Vancouver.—This new product of the Dublin Dockyard Company has recently made her maiden trip from the builders' yard to Vancouver, where she will go into service for the Union Steamship Company in the passenger and light-freight business on the protected waters of British Columbia. The vessel is 175 feet between perpendiculars, of 35 feet beam, and has four decks devoted to passenger accommodations. She was built under survey of the British Board of Trade and the British Corporation, and is specially strengthened in the shell plating forward and in all the deck and pillar construction. The propelling machinery consists of two sets of triple expansion engines working at 185 pounds pressure and supplied with steam by two specially large boilers designed for burning inferior coal. On trial the *Chelohsin* made 14.29 knots in service conditions and fully 13 knots with 300 tons of dead-weight on board, both performances being in excess of the guarantee. 850 words and photograph.—*Engineering*, February 9.

The Spanish Dreadnought Espana.—In February there occurred at Ferrol the launching of one of three Spanish dreadnoughts now building. The dimensions of the new vessels are: Length, 435 feet; breadth, 78 feet 9 inches; depth, 42 feet; draft, 25 feet 6 inches; displacement, 15,700 metric tons. The main battery consists of eight 12-inch guns; armor belt is 9 inches in thickness. Parsons turbines are used and the anticipated speed is 19½ knots. The manner of building is interesting. In 1908 tenders were called for by the Spanish Government for the building of three dreadnoughts in Spain and the reconstruction of certain dockyards under conditions whereby the larger part of the labor was furnished by the Spanish people and all of the engineering work by the contractors. The firms getting the awards were Sir W. G. Armstrong, Whitworth & Company, Ltd.; John Brown & Company, Ltd., and Vickers Sons & Maxim, Ltd., and under their directions this work has gone on. Simultaneously with the completion of their ships the Spanish Government is getting the benefit of a practical training for their dockyard force as well as the thorough reconstruction of the yards themselves. 600 words and sketch.—*The Engineer*, February 9.

The Economical Speed of Ships.—By George Harrison. A brief and clear description of a graphical method of working out the most economical speed for a given ship on a given voyage when the coal consumption at different speeds is known. Variations of the problem are its solutions when the vessel is steaming with and against a current of known speed. An important problem explained in words of one syllable. 1,800 words.—*Cassier's Magazine*, February.

The Safety of Ships at Sea.—Paper by Prof. W. S. Abell, M. I. N. A., before the Liverpool Engineering Society. The whole question is divided into two headings: "The safety of ships at sea must be influenced by two considerations: (a)

Whether the control of the vessel is injured in any way owing to the breakdown of the engines, steering gear or rudder, or (b) whether the buoyancy of the ship is impaired by flooding, caused by loss of hatches, by working of the structure, or by collision." The data available for such a study is necessarily very limited, and consequently the results are claimed only for general cases. Elements considered are the ship's statical stability, ratio of breadth to depth, and the proper use of water ballast. Wind pressure is given considerable attention, both quantitative and qualitative. From an analysis of Lloyd's Register a proper ratio of breadth to depth is deduced for probable worst weather conditions. 3,300 words.—*The Steamship*, February.

The Salving of the Submarine Boat A3.—The damage caused by the collision of the submarine boat A3 and the gunboat *Hazard* has been proved to be very serious. Doubt has been expressed as to the advantage of raising the vessel except as a means of discovering possible improvements in future design. This is not important, for the later boats are immensely superior to the original boats of the A class, particularly in the elements of design tending to minimize disaster. Owing to the exposed position of the sunken vessel the task of raising it has been large. At first Admiralty lighters were put upon the work, but later the assistance of a salvage company was obtained. The procedure now being adopted is the use of air in rubber tanks by which the buoyancy of the vessel is to be restored. These tanks are filled with water, sunk into position within the vessel and air forced in at pressure high enough to expel the water. By this means it is hoped to float the vessel to a nearby dockyard. 900 words.—*Engineering*, February 16.

The Föttinger Hydraulic Power Transmitter.—Its Advantages with High-Speed Turbines. A very brief statement of what the Föttinger invention is and what it accomplishes, illustrated with diagrams showing saving in space of the machinery installation on vessels of several types supplemented by figures of weights and steam consumptions involved. One example is that of a cross-channel steamer of 1,600 tons displacement and 4,800 horsepower. With direct-acting turbines the propeller revolutions are 600, the machinery weight 166 tons, and the steam consumption with saturated steam is 15.45 pounds; with the Föttinger transmitter the propeller revolutions were reduced to 450, machinery weight to 75 tons and steam consumption to 14.22 pounds. 800 words.—*The Steamship*, February.

Liquid Fuel.—A review of a paper by Captain Edoardo Gianelli, of the Italian Corps of Naval Architects. In this paper the author deals with the various sources of supply of petroleum, with its characteristic features, and with methods used for its carriage and storage. He then reviews the different systems followed for firing boilers with liquid fuel. Speaking of atomizers, he divides them into three classes, steam jet, those using compressed air and those in which the liquid fuel is under pressure. The last of these, in the author's opinion, meets with the greatest favor at the present time. In fitting burners to boilers an advantage of 10 percent greater efficiency can be obtained by using independent atomizers instead of having one common air receiver. Any type of boiler can be adapted for burning oil, but those boilers are preferable which have long furances and not too much heating surface exposed directly to the flame. An ample combustion chamber is of special importance. Tests have shown that about 0.8 horsepower per square foot of heating surface can be obtained.

With watertube boilers having an ample combustion chamber and good atomizing 0.6 horsepower per square foot may be safely figured. Captain Gianelli states that the only serious objections to oil fuel are its high cost and the difficulty of arranging for its supply. In Italy oil fuel costs about twice as much as coal, ton for ton, but owing to the greater heating value of the oil its real cost is only about 30 percent greater than coal. 950 words.—*Engineering*, February 16.

Notes on Two-Cycle Oil Engines.—By F. Duncanson, B. S. A clear and concise exposition of the principles on which the two-cycle oil engine works with a consideration of improvements whereby it may be made as advantageous as the four-cycle motor. The disadvantages of the two-cycle machine most considered are scavenging and its attendant losses, and the matter of compressing air, whether accomplished by an attached pump or independently of the engine. As for scavenging, the author attacks this problem at its weakest point, *i. e.*, where the indicator card made by a weak spring shows that the exhaust curve goes below the atmospheric line. He suggests that scavenging valves open here, thereby making less work for the air pump and reducing the necessary pressure for accomplishing this important work in a thorough manner. That this can be actually done is shown from diagrams taken from engines in operation. Another point to which attention is called is the matter of a reservoir for carrying a supply of compressed air. This should be as large as possible in order to keep up air pressure throughout the scavenging operation. In the remarks following the reading much favorable comment was offered, and suggestions that the results therein indicated were not only possible but had already begun to be obtained, showing the value and practicability of the paper. Paper and discussion 7,200 words.—*Transactions of the Institute of Marine Engineers*, January.

Note on the Screw Propeller.—By H. A. Mavor. As the author states in his introduction, "It is not here proposed to discuss any of the 'theories' of propeller action but to apply to recorded experimental results the methods of analysis which have been long in familiar use by the electrical engineer, who is accustomed to an exactitude of measurement not generally applied in other engineering practice. The method proposed is to record and compare all experimental results not under the broad generalizations of 'propulsive efficiency,' but by specific reference to a standard of comparison." This standard of comparison is the efficiency of the propeller as a pump, to which its efficiency as a propulsive instrument is compared with the advantage of recognizing some of the loss as inevitable and impossible of elimination by improvement in design. The performance of the propeller as a pump is measured by a trial with the ship moored and the resulting thrust produced in the mooring line. By an ingenious analysis, forces acting and work done are resolved into so-called propulsive and impulsive efficiencies, a distinction due to the acceptance of the principle that some work would be lost with the use of even a perfect propeller. By separating total work done into useful and lost work the method is simpler than those resulting from the use of the blade theory. Wake factor and its effects are considered with the usual difficulties, but it may be said with more of satisfaction than is usually the case, because of a more direct manner of measuring useful results. 7,000 words.—*Transactions Institute Engineers and Shipbuilders in Scotland*, Fifty-fifth Session, 1911-1912.

The Case for Increase in Caliber of Naval Guns.—Editorial comment on the topic introduced by Count Giraldi before the First Italian Congress of Naval Architects and Mechanical Engineers. Contrary to the Count's conclusions, the editors hold that there are weighty reasons for the adoption of larger caliber guns that the 12-inch in modern battleships. The reasons given, and urged at some length, are the greater life

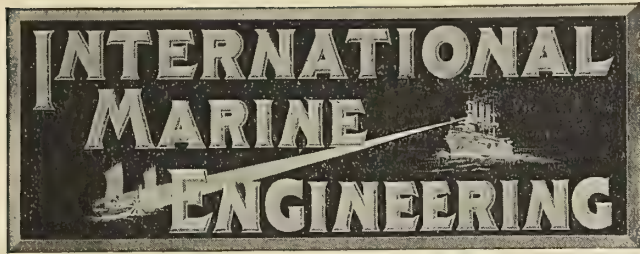
of the gun for a given power, the increased charge of explosive possible in the larger shell, and the greater moral effect of the larger gun. From the standpoint of the naval architect there seems to be no serious disadvantage in the larger weapon even when arranged in threes in turrets, which plan is coming rapidly into favor in some quarters. 2,000 words.—*Engineering*, February 16.

Liquid Fuel as Supplied by the British Petroleum Company, Ltd.—This company has established large storage facilities for liquid fuel in all the principal ports in England, that at the Royal Albert Dock in London having a capacity of 42,000 tons. This article tabulates a list of the advantages of oil fuel over coal, especially for marine work. There are a number of photographs accompanying, showing in a graphical way the most important of these. In closing there is given drawings and a description of Kermode's patent oil burners of three different types—the hot air burner, the steam burner and the pressure-oil burner. These have been used quite extensively, and the first named especially shows a high thermal efficiency under test and a low fuel consumption for its operation. By its use 83 percent of the heat in the fuel is recovered in actual work, and less than 2 percent of the steam is used to operate it, and the water from this is recovered by condensation. 3,500 words.—*The Steamship*, December.

Shipping on the Great Lakes of America.—By Mr. A. E. Jordan. A lengthy article of general description about the shipping on the American Great Lakes. It has apparently been written by a traveler to tell his friends of the new land visited, and this is done with special regard to technical subjects. The author begins with statistics of the geography of the lakes and the facts of the great shipping thereon. The main topic of the paper is a general description of the types of steamers in use and the yards where they are built. Sizes, types of machinery, methods of building, eccentricities of design, are all touched upon, and as a whole it is an interesting commentary of the steamship situation of our inland seas. The author presents the facts which are the essential ones to an audience of marine engineers and naval architects. 6,000 words with photographs and map.—*The Marine Engineer and Naval Architect*, December.

New Ore Unloading Docks.—Vessel owners on the Great Lakes have recently come to the realization of a surplus of ships due to the recent great improvement in ore-loading docks. There have been, or soon will be, completed three new ore docks capable of handling by the most approved methods the mammoth cargoes shipped on the Great Lakes. Each of these is described more or less in detail and is accompanied by drawings and photographs which give a good idea of the size and general plans of the structures. The docks described are one at Presque Isle, Lake Superior, belonging to the Lake Superior & Ishpeming Railway Company; the dock at Two Harbors, belonging to the Duluth & Iron Range Railway Company, and the Great Northern Railway dock at Superior. This last, which was placed in commission last season, is of concrete, equipped with 151 double ore pockets with a capacity of 325 tons each, making a total storage of 98,150 tons. The dock is 1,900 feet 7½ inches long from end to end of crib. Pockets are standard width of 12 feet. This dock has made some very quick records, one vessel being loaded with 9,500 tons in 25 minutes, and eight vessels with an aggregate of 62,000 tons in six hours. 2,900 words.—*The Marine Review*, February.

The Rolling of Ships.—By Prof. J. H. Biles, LL. D. Presidential address before the Engineering Section of the B. A. A. S. A mathematical discussion of wave sequence and its results, based on the theory of Froude and compared with the results of experiments by Col. Russo, of the Italian navy.



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Up to the present time advocates of the marine oil engine have been obliged to base their claims very largely on theoretical data and information derived from isolated cases of experimental work. The general theory and principles of this method of propulsion have been thoroughly exploited and are readily available from reliable sources. The thermal efficiency of the Diesel engine is undisputed and the practicability of perfecting the mechanical details of construction of such an engine has been repeatedly demonstrated by the great number of different designs that have been so rapidly developed. That this should result in the immediate and widespread adoption of the oil engine by the shipbuilder and shipowner is not to be expected, however, without some further accurate information concerning the practical performance of such installations after continued service under all conditions of weather at sea in the hands of experienced sea-going

engineers, where the reliability and actual economy of the engine will be exhaustively tested. Reliability, handiness and a small maintenance and repair bill are, in most cases, as essential to the success of marine machinery as a saving in the fuel bill and an increased earning power of the vessel.

Early installations of oil engines were confined to small craft, including a few Russian gunboats and French submarines. Detailed information from such installations was difficult to obtain, but the advent of the first oil-engined ocean liner, described in this and previous issues, affords a valuable opportunity to gain some knowledge of how the oil engine will work out in every-day practice on a comparatively large scale.

The reports so far received from this vessel indicate that the builders' claims have been substantially justified; and as the owners have immediately placed orders for further equipment of the same type, this success promises well for the future trial and adoption of the marine oil engine.

The tendency in the development of oil engines is toward simplification of the details and the perfection of the two-stroke, double-acting engine, which will probably pave the way to the building of engines of large power. In the engines already built for commercial purposes the size has not advanced beyond 300 horsepower per cylinder, while single cylinders, developing less than 150 horsepower, are more common. In the smaller installations the four-stroke engine has some distinct advantages, but larger powers have been produced with the two-stroke type of engine. In experimental work single cylinders of both the single and double-acting type have been built to develop 2000 horsepower, but so far the results have not led to the adoption of engines of such size on board ship.

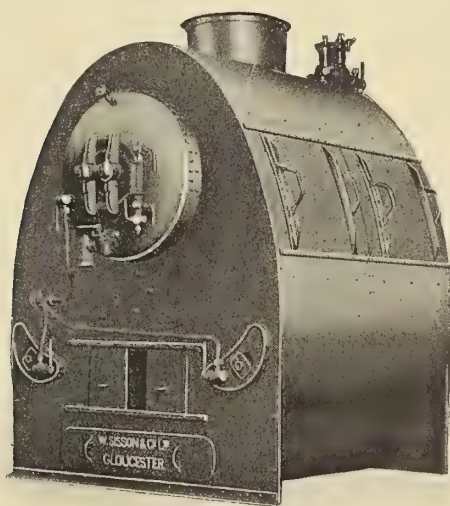
The cylinders in these large experimental engines have not exceeded 33 inches diameter, while in the smaller engines, which have been actually adopted, the diameter has been less than 25 inches. One of the obstacles that is always facing the engineer, in an attempt to increase the size of the cylinder, is the quality of material which is available for the castings. Here the metallurgist must be sought, and perhaps the growth of the marine oil engine will depend upon him as much as upon the engineer who designs the mechanism of the engine.

Along with the rapid development of the marine oil engine there has been another type of internal combustion propelling machinery that should not be lost sight of, and that is the suction gas producer plant. Although it has not been developed in such large units as the oil engine, yet it has proved a source of remarkable economy in certain types of moderate speed boats. It has the particular advantage of enabling the use, with some modifications, of the marine gasoline (petrol) engine which has been so highly perfected.

Improved Engineering Specialties for the Marine Field

The Sisson Watertube Boiler

A watertube boiler for high working pressures, which is much lighter than ordinary return tubular or other types of shell boilers, but which is still not of the proportions of the "express" type of watertube boilers, is manufactured by W. Sisson & Company, Ltd., Gloucester. These boilers, as shown by the illustration, consist of a large steam drum with two water drums connected by straight tubes. The boiler, therefore, has ample water supply and steam space, the tubes are of large diameter in relation to their length, and the arrangement is such that all parts of the heating surface can easily be examined and cleaned. No rivets or seams are exposed to the fire, or even to the waste gases. The design is such that steam can be raised quickly without damage to the boiler,



and a sudden inrush of cold air through the furnace door can have no harmful effect on the parts of the boiler exposed to the sudden change of temperature.

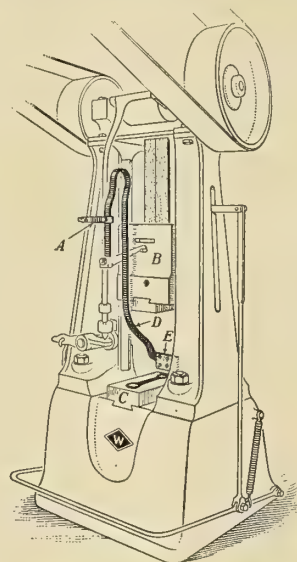
The steam drum, which is cylindrical, and of large diameter, is made of two plates, the upper portion being of the usual thickness required for a shell of that diameter, while the lower, which forms the tube plate, is of special thickness, but planed down along each margin to a suitable thickness for connecting to the upper plate and, at the same time, avoiding a tendency to grooving. The two longitudinal joints thus formed are lapped and triple-riveted. The ends of the drum are of dished form, pressed out with deep flanges, double riveted to the shell. The two water drums are welded tubes carefully pressed into a suitable lune-shaped cross-section, the ends being flanged or formed of solid plate single riveted to the shell. The tubes are straight, and all are of the same length, the length being so proportioned in relation to the internal diameter of the steam drum that all of the tubes can be inserted or extracted from the inside of the drum. The upper ends of the tubes in the steam drum are expanded by ordinary short expanders, while the lower ends in the water drums are expanded by a special long expander inserted from the steam drum, so that all of the tubes cannot only be inserted and withdrawn but also expanded at both ends from the inside of the steam drum.

The boiler casing is formed of mild steel plate and angles fitted with suitable non-conducting linings and baffle plates. The lower part of the casing is lined with firebrick to form

the furnace. These boilers are built for working pressures up to 250 pounds per square inch.

A Useful Safety Device

The illustration shows a device made by J. H. Williams & Company, Brooklyn, N. Y., for automatically preventing accidents in drop-forging shops following the practice of supplying "precision products." Drop-forgings which require little machining are frequently furnished to gage sizes, and therefore are "restruck" in the forging dies after the "flash" or excess metal has been removed. Through some discon-



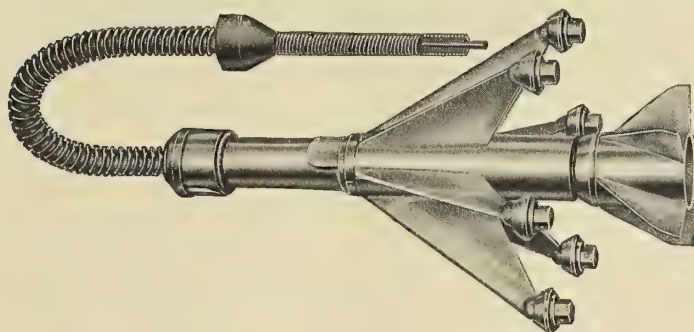
certed action the operator, when seating the forgings in the die-impression by hand, meets with serious injury from an untimely falling of the ram. To avoid such accident, the spring-steel device, shown in darker outline of the illustration, is clamped to the guide or upright at *A*. When the ram *B* descends, its contact with the device at *D* automatically forces the hand of the operator to a place of safety *C*; the leather pad *E* modifies the force of the blow to the operator's hand.

A New Log

The Maritime Instrument Company of Boston, Mass., is preparing to put on the market a new log mechanism, which they claim embodies many advantages not to be found in any system now in use. Extensive experiments and tests have been conducted during a period of four years, and before deciding to offer the apparatus for sale the company has subjected it to 50,000 miles of actual service without a breakdown or any appreciable signs of wear. The equipment consists of a protected rotator, designed to be towed alongside the vessel by means of an insulated armored cable and held clear of the hull by means of a short boom, the cable thence running through the hull of the vessel near the main deck just below the bridge and being connected to an instrument located in the pilot-house or in any other desirable location. The resistance of the actuator to the water is about the same as that of a taffrail log. This actuator, which normally runs under 6 to 10 feet of water, will under ordinary conditions be held by the boom several feet away from the hull of the ship; but in order that the rotator may not be injured by striking the side of the ship or fouled by floating matter, such

as seaweed, ice or drift wood, it is protected by a number of fin-shaped arms with rollers at the ends. These arms are thin and attach to the main body (which does not rotate), and slope back in such a way as to resist any interference. The actuator contains a watertight compartment, in which is a circuit-breaking mechanism. One contact is made in this chamber to each 150 turns of the rotator, and this represents one-tenth of a mile of travel. This contact is transmitted from the submerged mechanism through a government standard insulated and armored cable of tensile strength of about 1,500 pounds to the instrument in the pilot-house.

The pilot-house instrument in its simplest form consists of a bronze case containing magnets and a five-number total-mileage counter and light; the number to the extreme right representing tenths of miles and the four numbers to



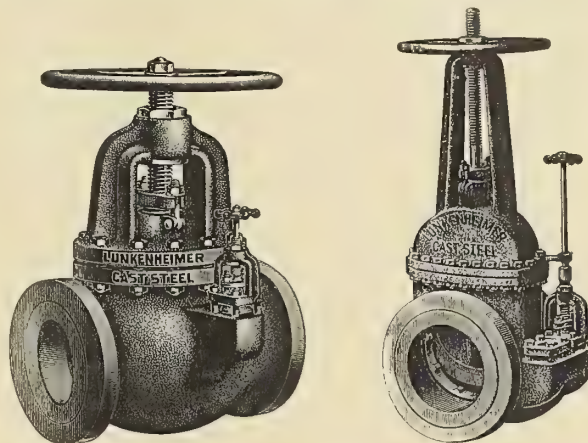
the left the total miles traveled. It is so arranged that all numbers may be set back to zero, at any time desired. A more elaborate pilot-house instrument can be used if desired, which, in addition to showing the total miles traveled, will indicate by pointer and dial the rate of speed at which the ship is traveling and keep a record chart showing the speed made at any particular minute. The third part of the system is simply a small storage battery or set of dry cells, to furnish electric current for charging magnets in the pilot-house instrument.

This log is claimed to be more accurate than the logs in common use, as it is operated from the side of the vessel where it is not affected by the wake of the ship; and as it runs always in deep water, it can be run anywhere the ship travels, from dock to dock if desired. The log readings are shown in the pilot-house, thus avoiding the inconvenience of sending to the taffrail. It is claimed that the log will not become entangled in seaweed or other floating matters, a difficulty to which existing logs are subject—a most important feature in tropical waters. There is no need of taking in the cable and rotator when the ship stops at sea, as it is impossible for them to come in contact with the propeller, and the log cannot be fouled by boats passing close to the stern, for the actuator is well forward of the stern, and it cannot be tampered with by meddlesome persons.

Lunkenheimer Cast Steel Valves

Superheat and high-steam pressures have created a demand for valves of greater strength and durability than those made of cast iron. The Lunkenheimer Company, Cincinnati, Ohio, have designed a complete line of globe, angle, cross, gate, check and non-return boiler-stop valves made of cast steel for service where high pressures and superheat are used. With the exception of the largest sizes, the Lunkenheimer cast steel valves are made of crucible steel and not open hearth or converted steel. Crucible steel is made and melted in closed crucibles, out of all exposure to furnace gases, and solid castings free from blow-holes are thereby insured. This is not true of the open hearth and converter steels, the first of which is heated by blowing hot gases over the molten metal, and the second by blowing them sometimes through the metal.

Aside from forming blow-holes these gases form oxides, which dissolve in the steel and thereby reduce its ductility and cause a low elastic limit. All of Lunkenheimer cast steel valves are annealed, which, it is claimed, relieves all internal stresses and makes a fine crystalline structure, which is very essential to strong steel. The valves are made to meet the specifications of the American Society for Testing Materials, and it is claimed they contain less than .05 percent of either

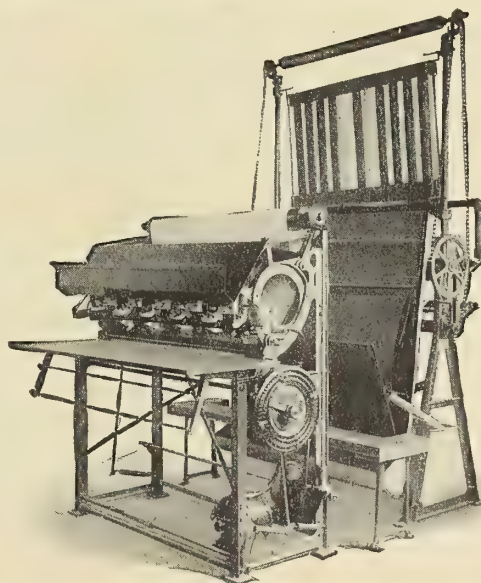


phosphorus or sulphur. The tensile strength of Lunkenheimer cast steel is about 80,000 pounds per square inch, with a safe elastic limit and excellent elongation.

For various pressures and degrees of superheat and to meet the requirements of engineers who differ as to the material used, Lunkenheimer cast steel valves are made in two combinations of material as regards the trimmings. For lower pressures and degrees of superheat the company manufactures a large and complete line of cast iron and "puddled" semi-steel valves.

A Continuous Automatic Electric Blue Print Equipment

The C. F. Pease Company, of Chicago, Ill., recently placed on the market a continuous automatic electric blue print equipment under the trade name of "Peerless." The illustration represents the Peerless equipment arranged with an electric



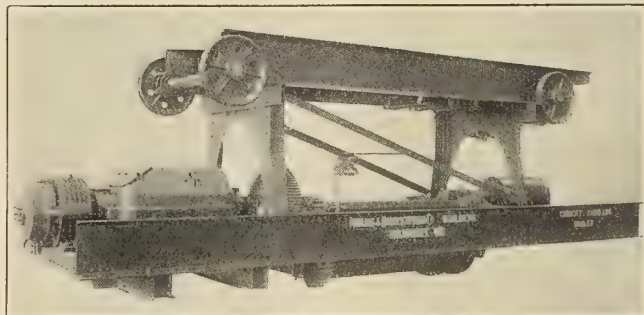
dryer showing a series of cut-outs so that only sufficient electricity need be used to dry the paper, varying with the speed at which the printer is running. A gas dryer can be used to excellent advantage when gas is available. This view of the printer shows the tracing tray pushed backward and one lamp turned down on the table, illustrating the method used for clean-

ing the globes and trimming the carbons. The apparatus not only prints, washes and dries the paper by one continuous operation, delivering the finished prints at the end of the dryer automatically wound up in a loose roll ready for use, but it also returns the tracings automatically to the operator as he stands in front of the machine. It is claimed that the operator is able to do 25 to 33 1/3 percent more printing than with other machines, while the washing and drying apparatus more than doubles the output. In other words, with one of these complete equipments it is possible for a large user to cut the cost of his blue printing bills in half.

Another very interesting feature of the machine is that the exposure can be immediately seen, and the speed of the machine increased or decreased instantly by means of the electric speed control at the right hand of the operator. The speed being controlled directly through the motor, all belts and unreliable friction disks are dispensed with, and in the case of a varied load on the line the speed of the printer varies with the lamps, thus preventing the spoiling of the prints. The apparatus is very compact, requiring a floor space only 5 1/2 by 6 1/2 feet, and with it it is possible for one operator to deliver up to 100 yards finished blue prints per hour, depending on the speed of the paper and the character of the tracings. There are no expensive glass cylinders or transparent bands requiring replacement. The printing surface is a segment of heavy plate glass mounted in an iron frame, and so hung that there is no possibility of breakage and the cost of maintenance has practically been eliminated. A better quality of blue prints is also claimed, as it is possible to obtain a very close exposure, and by the method of washing only the printed side of the sheet and drying uniformly the entire width the prints are delivered in the rewinder perfectly free from wrinkles or distortions, and where a high grade of paper is used it is possible to produce them without shrinkage.

Milwaukee, Wis., designed and built the high-speed trolleys illustrated.

These trolleys are of the man-riding type; that is, they carry a cage for the operator. The trolley travel speed is about 700 feet per minute, and the hoisting speed, with a 5-ton load, 250 feet per minute. One of the special features of the hoisting mechanism is the arrangement of parts for taking the hook off of the hoisting rope and slipping the same



PAWLING & HARNISCHFEGER HIGH-SPEED TROLLEY

hoisting rope into a single-rope grab bucket of the latch open type. Rope guards on the bucket are arranged in such way that they can readily be opened, and the hoisting rope, which also performs the functions of the closing line of the bucket, readily inserted. A novel feature in the application of a single-line bucket of this type is to use it with a set of holding lines as used on a two-line bucket. This holding line is wound upon a drum operated by a motor just big enough to keep the slack out of the rope, either going up or down. In this way it is possible to discharge the bucket at any desired height by means of a large foot-operated band brake on the



FREIGHT-HANDLING APPLIANCES AT THE TEXAS CITY WHARVES

High-Speed Trolleys for Handling Miscellaneous Freight

The Texas City Transportation Company, Texas City, Tex., maintains huge warehouses where a miscellaneous assortment of material, from bales of cotton to pig iron, is constantly being received or shipped. To handle this material rapidly and economically the Pawling & Harnischfeger Company,

holding drum. When the bucket is fully open, and therefore latched, the foot brake is released, and the weight of the empty bucket is again placed on the closing line, when it can be lowered without closing until it strikes the stock pile. This design was worked out in this manner in order to concentrate all the motor capacity of the hoist motor on the one drum

which is used for the hook service as well. When the bucket is not in use the holding line is disconnected from the bucket and wound up on its drum, which then remains at rest. The holding-drum motor performs about the same function as the spring in a curtain roller; that is to say, it tends to run ahead of the hoist motor when going up and to lag behind the latter when going down. In this way the holding line is never slack, and it is therefore impossible to jerk the line when the bucket is discharged.

In connection with the hook service a lifting magnet of $2\frac{1}{2}$ tons capacity is used. The feed cables for this magnet are wound up and paid out by a small motor-operated winding drum. The performance of this cable take-up is exactly the same as the holding-drum mechanism; that is, the cable is always under slight tension going either up or down.

The trolley is of the inside-running type, and is operated on a plate girder cantilever arm, which can be moved longitudinally over the boat to an extent of about 60 feet beyond the face of the dock. The reason for this peculiar construction lies in the fact that it is impossible to move a hinged apron of the ordinary construction through the rigging of large sailing vessels, such as these unloading machines frequently have to serve, either loading or unloading, the great extension of the cantilever being necessary in order to load or unload lighters tied up on the outside of the big vessel.

A 100-horsepower mill type motor is used for hoisting and a 35-horsepower railway type motor with a foot brake for travel. The hoist controller is of the magnetic switch-operated type with a motor controller, dynamic braking. The load is sustained by a disk motor brake of unusually large proportions and of a new design which will permit of the instant adjustment of the air gap.

Improved Sterling Lubricators

For efficient cylinder and valve lubrication it is necessary to maintain a lubricating film over the rubbing surfaces, and when once this film is established to feed to these surfaces at frequent intervals just sufficient oil to replace that which is working on through to the exhaust. To accomplish this four things must be considered: the moisture in the steam, the proper location of oil feeds, quality of oil and the manner of feeding the oil. The improved Sterling lubricator, manufactured by the Sterling Machine Company, Norwich, Conn., has been designed to meet these conditions.

A substantial tank is provided, through which is cast a hollow hub containing the main operating shaft, driven by a connecting rod attached to some reciprocating part of the unit to be lubricated. The lever is held by a wing nut, and may be moved in and out, thereby varying the amount of rocking motion of the piece which is termed the driving hub. This hub, by means of hardened pawls, drives the hardened drop-forged ratchet, which is held from moving in but one direction by back-lash pawls working in reamed holes in the main tank casting. The ratchet is pinned to the main shaft, which carries at one end a strong hand crank and at the other end a broad-face steel cam operating the yoke. This yoke has a large hollow shank working in a reamed hole in the main casting. The hollow shank is filled with oil, and contains a felt wick for lubricating the cam. This yoke, as it rises and falls with the cam action, carries with it the pumping plungers, the adjustment and action of which are self-evident. The various parts of the device are easily accessible and can be easily removed and examined. The valves of the pumps are of the steel ball type. Each pump has two suction and four delivery valves. A positive-acting check valve has been carefully designed and a reliable oil-feed indicator is provided if desired.

Technical Publications

The Mechanical World Pocket Diary and Year Book for 1912. Size, 4 by 6 inches. Pages, 426. Illustrations, over 100. London, 1912: Emmott & Company, Ltd. Price, cloth, 8½d.; leather, 1s. 8½d.

This is the twenty-fifth year of publication of this book and, as is the custom, parts of it have been revised and some additions made to bring the book up to date. It is essentially a mechanical engineers' pocketbook, containing a vast amount of useful information expressed in concise form with the aid of tables and diagrams. The section on steam turbines has been partly rewritten and extended since the last volume was issued. New sections on indexing on the milling machine, on verniers and micrometers, and on gaging cylindrical bores have been added, together with sections dealing with roller bearings, helical springs, cutters for milling spiral gears, speed calculations, etc. New tables of weights and proportions of rivets, helix angles, areas of circles in square feet and a millimeters-to-inches conversion table have been introduced.

The Mechanical World Electrical Pocketbook for 1912. Size, 4 by 6 inches. Pages, 290. Illustrations, 80. London, 1912: Emmott & Company, Ltd. Price, 8d.

This book is a companion volume to the one above reviewed. It contains a collection of electrical engineering notes, rules, tables and data. The book is published annually, and the present volume has been enlarged by the addition of sixteen pages. The matter devoted to lighting has been entirely rewritten, and new sections on motor starters, static transformers and the construction, rating and testing of high-tension apparatus have been added.

Experimental Engineering. By U. T. Holmes, Commander, U. S. N. Size, 5¾ by 9¼ inches. Pages, 311. Illustrations, 152. Annapolis, Md., 1911: United States Naval Institute. Price, \$2.50.

A previous volume, called "Notes on Experimental Engineering," was published by this author in 1907. This book, therefore, is a revision of the former work, to which has been added much new matter, together with a complete revision of the whole book. Much of the information has been taken from other text-books, but, as a whole, it represents in a clear manner a very important branch of the engineering profession. The means of testing materials and appliances employed in engineering work, with descriptions of the instruments and methods of procedure, are given in very complete form. The book would be very useful to either students or practicing engineers who are devoted to other work besides marine engineering.

The Testing of Motive Power Engines. By R. Royds. Size, 5¾ by 8¾ inches. Pages, 396. Illustrations, 193. New York and London, 1911: Longmans, Green & Company. Price, 9s. net.

In the preface the author states that this book is intended for engineering students who have already acquired an elementary knowledge of motive engineering, and who desire information on the practical testing of motive power engines. In other words, the information given is supplementary to the work which is carried out in the laboratories of technical schools. It covers the work which is usually encountered in actual engineering practice and deals with the methods in common use. After going into the general principles concerning motive power engines, the measurement of pressure, temperature, horsepower, etc., different types of engines, including locomotives, motor cars, reciprocating steam engines, steam turbines, internal-combustion engines, gas producers, steam boilers and auxiliary machinery, such as condensing apparatus and pumps, are discussed in detail. The final chapters deal with refrigeration tests, air compressors, air motors, fans, blowers, water turbines and pumps.

The Navy League Annual. Edited by Alan H. Burgoyne. Size, 5½ by 8½ inches. Pages, 341. Numerous illustrations. London, 1912: John Murray. Price, 2s. 6d. net.

As this is the fifth year of publication of this Annual, doubtless many of our readers are familiar with its general purpose. The book is divided into three parts. The first takes up the progress of British and foreign navies; the second contains a series of articles by special writers on a great variety of subjects relating to naval matters, and the third contains a list of ships and comparative statistics, together with dock and ordnance tables. The editor points out that naval progress during the past twelve months has been regular and sustained, there being no remarkable innovation as was the case last year. Ships mounting 13.5-inch guns are now building. Ships mounting 16-inch guns have been designed. A speed of 30 knots or more has been attained by immense armor clads, while submarines mounting guns are approaching completion. These are noteworthy facts, yet they follow the natural cycle of development and do not present any innovations such as were chronicled in the previous year.

Personal

GEORGE SHEPARD, chief engineer of the marine department of the Maryland Steel Company, Sparrows Point, Md., has been appointed chief engineer of the American-Hawaiian Steamship Company, New York.

A. L. HOPKINS, works manager of the Newport News Shipbuilding Company, Newport News, Va., has been elected vice-president of this company, in charge of the New York office, and H. L. Ferguson, formerly superintendent, has been made general manager of the company.

Obituary

HENRY WILSON SPANGLER, M. S., Sc. D., Whitney professor of dynamical engineering University of Pennsylvania, Philadelphia, died Sunday, March 17.

PROF. PHILIP R. ALGER, a member of the Special Ordnance Board of the United States Navy Department, and for many years editor of the *United States Naval Institute Proceedings*, died at Annapolis, Md., Feb. 23. Prof. Alger was born in Boston Sept. 29, 1859, and graduated from the Naval Academy in 1880. In 1890 he was appointed professor of mathematics in the navy with the rank of lieutenant, and later was promoted to the equivalent rank of captain. Prof. Alger's books on ordnance and applied mechanics are considered standard works, and are used as text books at the Naval Academy.

NAVAL CONSTRUCTOR ROBERT W. STEEL, retired, died at Spring Lake, N. J., Feb. 29. He was born in Ireland in 1831, and was appointed master shipwright at the New York Navy Yard early in 1861. Throughout the Civil War he was assistant to the naval constructor at that yard, and in May, 1871, he was appointed an assistant naval constructor and ordered to the Philadelphia yard, where in 1875 he was promoted to the rank of naval constructor and later served at various yards, retiring in 1893 on account of age.

WILLIAM McALLISTER, a retired yacht builder of City Island, New York, died of heart disease at Washington, D. C., March 24. During the Civil War he was at the shipyard of Mr. William H. Webb in New York, and there was employed in the construction of many of the gunboats built for the Federal Government. He was subsequently employed in the construction of many famous yachts. He is survived by a widow, two daughters and one son, Mr. Charles A. McAllister, engineer-in-chief of the Revenue Cutter Service.

REAR ADMIRAL GEORGE WALLACE MELVILLE, U. S. N., retired, prominent in Arctic exploration and naval engineering, died at his home in Philadelphia, March 17. Admiral Melville

was born in New York City in 1841. He was educated in the New York public schools and the Brooklyn Polytechnic Institute. Later he became associated with the engineering works of James Binn in Brooklyn.

At the outbreak of the Civil War he became a third assistant engineer in the United States navy, and served with signal ability on board various vessels. At the close of the Civil War he continued his service on various vessels and in navy yards until in 1879 he went to the Arctic from San Francisco with Lieut. George W. De Long on the *Jeanette* expedition. He was one of the few survivors of that hazardous expedition, and his exploits brought him international fame.

A few years later Mr. Melville returned to the Arctic on another expedition, and recovered not only the records of the *Jeanette* expedition but the bodies of Lieut. De Long and his companions. In appreciation of his bravery on this expedition he was advanced fifteen numbers in rank in the navy and a gold medal was struck for him by special act of Congress.

In August, 1887, he was appointed chief engineer of the navy, a position which he held for sixteen years, during which time he was responsible for the designs of the machinery for 120 warships with an aggregate horsepower of 700,000. Rear Admiral Melville was the first engineer-in-chief to use water-tube boilers in large war vessels, and he was the first naval engineer to secure accurate data upon the coal consumption of boilers on forced draft trials. His stand against the reduction of boiler weights at the time of the extensive use of forced draft was a pronounced achievement. Two of Melville's greatest successes were the perfecting of triple-screw machinery arrangement which made the *Minneapolis* and *Columbia* the speediest vessels in the navy at that period, and the introduction of the method of standardizing screws as a method of determining speed trials. It was to him also that the United States navy owed the first high-speed battleships—the *Maine*, *Missouri* and *Ohio*. Other achievements in his naval career include the repair ship and distilling ship which he fitted out during the Spanish war.

After his retirement from naval service in 1903 Rear Admiral Melville took an active interest in Arctic exploration and engineering progress, one of his latest inventions being the reduction gear which has been adapted to turbine drive in slow-speed ships. He was the recipient of many distinguished professional honors, receiving degrees from the Universities of Pennsylvania, Harvard, Columbia, Georgetown and the Stevens Institute. He was past-president of the American Society of Mechanical Engineers and the American Society of Naval Engineers. He was also a member of the Society of Naval Architects and Marine Engineers, an honorary member of the Institution of Naval Architects, an honorary member of the Royal Swedish Society of Anthropology, a member of the National Geographical Society, the Geographical Society of Philadelphia, the Naval Order of the United States and the Military Order of the Loyal Legion. He was also received in private audience by the Czar and Czarina of Russia, and decorated with the Order of St. Stanislaus of the First Class.

Burial of the Maine

The final sinking of the wreck of the United States battleship *Maine* occurred on March 16 off the coast of Cuba. Not only was the burial ceremony carried out in a manner befitting one of the most impressive events in the history of the United States navy but the occasion was fittingly recognized throughout the country in whose defense the *Maine* was lost. The raising of the *Maine* from Havana harbor was one of the most unusual and difficult engineering feats ever accomplished by the Engineering Corps of the army, and the successful completion of this task reflects great credit on those who had it in charge.

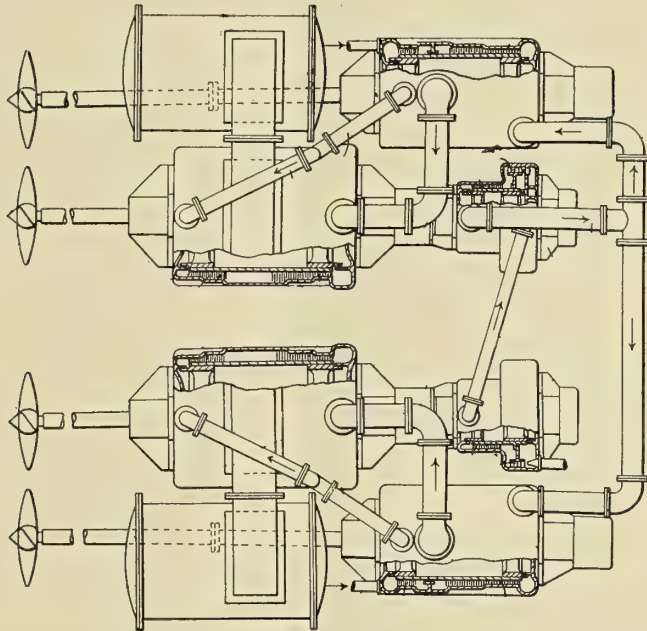
Selected Marine Patents

The publication in this column of a patent specification does not necessarily imply editorial commendation.

American patents compiled by Delbert H. Decker, Esq., registered patent attorney, Loan & Trust Building, Washington, D. C.

1,009,784. MARINE TURBINE INSTALLATION. CHARLES ALGERNON PARSONS, OF NEWCASTLE-UPON-TYNE.

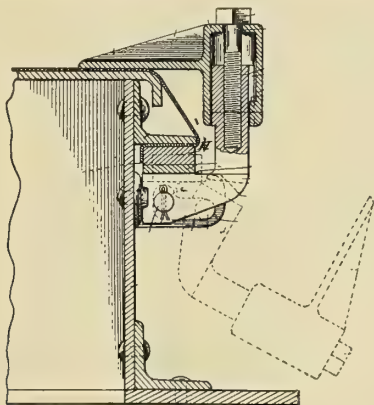
Claim 2.—In a marine turbine installation having high and low-pressure turbine elements, impulse turbine parts followed by reaction parts



constituting at least two of the high-pressure elements which are connected in series with one another, the impulse parts thus alternating with the reaction parts. Eleven claims.

1,008,146. HATCH-COVER FASTENER. HORATIO N. HERRIMAN, OF CLEVELAND, OHIO.

Claim 2.—In a hatch-cover fastener, the combination with a fastening member comprising an element pivotally mounted upon the hatch combing, a second element slidably mounted on said first-named element and adapted to project over the hatch opening, and means adapted to draw said two elements toward each other; of an abutment fixed to said combing



and projecting therefrom above the pivotal axis of said member; said pivotal element and abutment forming a seat for the batten. Four claims.

1,008,953. SHIP'S PROPELLER. FRANK CLENNELL, OF WELINGTON, AND FREDERICK WILLIAM THORPE, OF MOTUEKA, NEW ZEALAND.

Claim.—In a ship's propeller, the combination of a tail-shaft having a tapering end portion, a threaded outer end, and an axial bore therethrough; an inner boss-piece having a tapering opening therethrough fitting on said tapering end portion, and provided with outer recesses forming apertured flange portions; an outer boss piece provided with outer recesses forming apertured flange portions and an end bearing-recess; bolts in the apertures of the flange portions and holding the

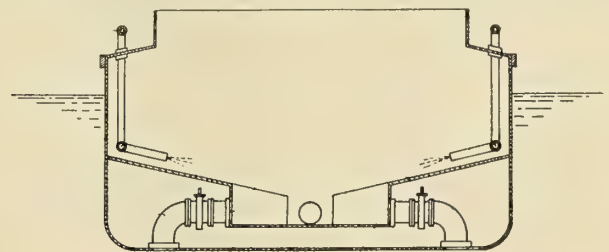
inner and outer boss-pieces together, whereby a substantially spherical boss is formed, said pieces being provided with hollow spaces and supplementary co-operative recesses forming radial bearings having annular recesses, the inner boss-piece also being provided with step bearings having closed inner ends and coaxial with the radial bearings respectively; shanks fitted in said radial bearings and the corresponding step bearings respectively; propeller blades on said shanks; bevel gears on said shanks and movable in said spaces; a spindle in said axial-bore and having its end seated in said bearing recess of the outer boss piece; a bevel gear on said spindle and meshing with the bevel gears of the shanks; means for adjusting said spindle relative to the tail shaft; a packing gland on the outer end of the tail-shaft and embracing said spindle; flanges on said shanks and seated in said annular recesses, and a nut on said threaded portion of the tail shaft and holding the inner boss piece in position.

1,008,235. BILGE PUMP. GEORGE EDWARD BADGER, OF MAYGER, OREGON.

Claim 1.—In a bilge pump, a chamber, blades mounted therein, there being inlet and outlet ports in the chamber, means for driving the blades, a chamber in communication with the first-named chamber at one of the ports, and two radially disposed wings, spaced apart and secured together adapted to rotate in the chamber. Ten claims.

1,012,196. APPARATUS FOR DISCHARGING DREDGE-HOPPERS AND THE LIKE. OTTO FRUHLING, OF BRUNSWICK, GERMANY.

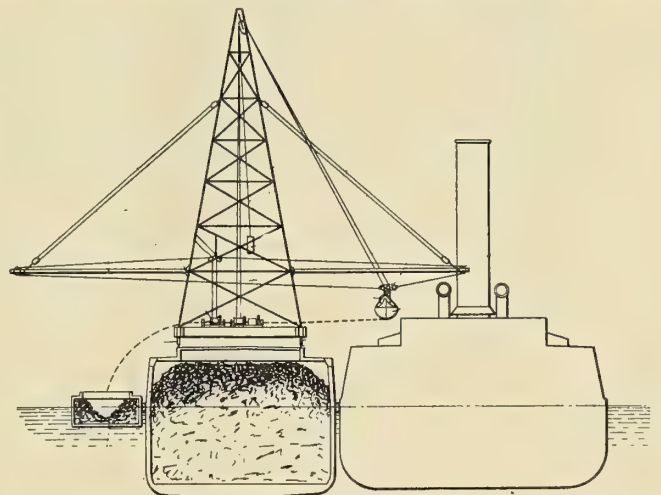
Claim 1.—In a device for discharging dredge hoppers and the like, a hopper for dredged material, a conduit opening laterally from the hopper near its bottom into the external water simultaneously introducing water



into the hopper and discharging material diluted by said water, and aprons adjacent to the lateral opening, keeping a space adjacent the lateral opening in the hopper free from dredged material. Four claims.

1,013,420. APPARATUS FOR TRANSFERRING MATERIALS. THOMAS SPENCER MILLER, OF SOUTH ORANGE, N. J.

Claim 2.—The combination of a support, a load carrier, a hoisting rope therefor, a hoisting rope actuator, an elevated hoisting rope sheave,



an elevated hoisting rope swinger frame, a pendulum rope for supporting said swinger frame, a weight constituting a take-up for said pendulum rope, and swinger ropes connected with said swinger frame and extending in opposite directions from said hoisting rope. Twenty claims.

1,009,753. LIFE-BOAT-HANDLING APPARATUS. ROBERT HUNTINGTON, OF BOSTON, MASS.

Claim 1.—A life-boat-handling apparatus comprising davits mounted to swing over the side of the vessel, a cradle for supporting the boat on the deck of the vessel with the keel of the boat on the inboard side of its point of suspension from the davits, tackle for lowering the boat and for swinging the davits, and means located within the boat for entirely controlling the said tackle to lower the boat and swing the davits. Thirteen claims.

1,009,758. BOAT LAUNCHING AND STOWING APPARATUS. ANTHONY J. LEWKOWICZ, OF NEW YORK, N. Y., ASSIGNOR TO THE MARTIN MARINE LIFE SAVING DEVICES, LIMITED, OF TORONTO, CANADA, A CORPORATION.

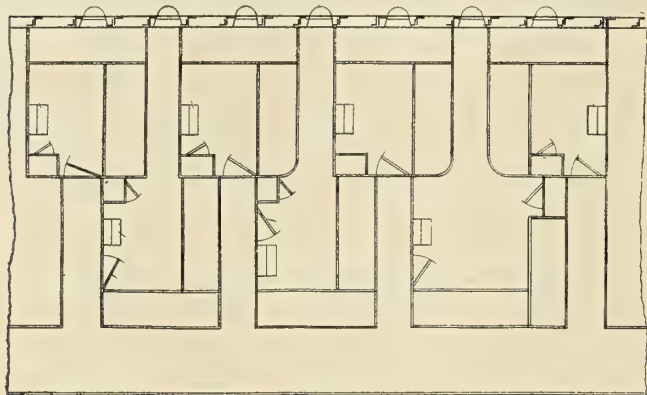
Claim 3.—In a boat-launching apparatus, the combination of a crane, a cam-shaped trackway higher at its outboard than at its inboard end, and movable supporting connections comprising track engaging and thrust

rollers between said crane and trackway so disposed as to cause the extreme end of said crane to revolve around a movable center to move at different angular velocities while moving over equal arcs of said trackway. Twenty-one claims.

British patents compiled by G. E. Redfern & Company, chartered patent agents and engineers, 15 South street, Finsbury, E. C., and 21 Southampton Building, W. C. London.

10,946. CONSTRUCTION AND DISPOSITION OF STATE-ROOMS ON PASSENGER SHIPS. BARON INCHCAPE, OF STRATHNAVER, G. C. M. G., K. C. S. I., K. C. I. E., London.

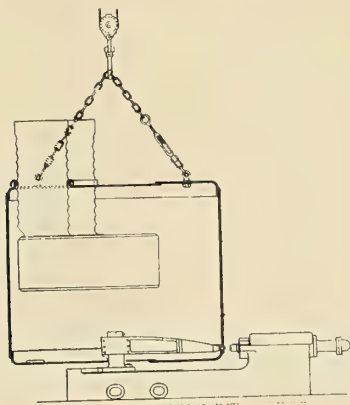
This invention has for its object to give inside staterooms access to the ship's side and more efficient light and ventilation than hitherto. Adjacent outside rooms, that is, the rooms abutting on the ship's side, are separated by a passage provided with a sidelight. The inside rooms



are so arranged with respect to the outside rooms that each passage leads to the middle of an inside room. The rooms have doorways leading into athwartship passages between the inner rooms; the outer rooms have doorways in the outer ends of these passages, and the inner rooms doorways in the sides.

24,208. RIVETING MARINE ROLLERS. W. B. THOMPSON, DUNDEE.

Hitherto, in marine boilers the ends of which have the flanges turned inward, the rear end only has been machine riveted. By the new method, the fore end is first riveted, then the fire-box pushed through its



opening in the fore end from within and suspended with the attached combustion chamber by means of wedges, so that room is left for operating the riveter on the rear-end flange.

27,144. SUBMARINE AUDIBLE TELEGRAPHY AND SIGNALING. DR. J. KLUPATHY AND BERGER.

This invention relates to a transmitting device comprising apparatus in which a ship's body or other floating object is connected with a vibrating system of strings or rods adapted to oscillate and stretched between the walls of the ship; or rods fixed in the center and caused to vibrate, the oscillations being communicated to the water by the body, acting as a soundboard. The string may be, for instance, excited by the rotation of a friction wheel covered with cloth, silk, etc. The sound continues as long as the wheel is rotating or the string touched and vibrated. Morse signals can thus be produced by damping the string between signals.

17,596. SIGNALING BY WATER SIRENS. NEUFELDT & KUHNKE, KIEL.

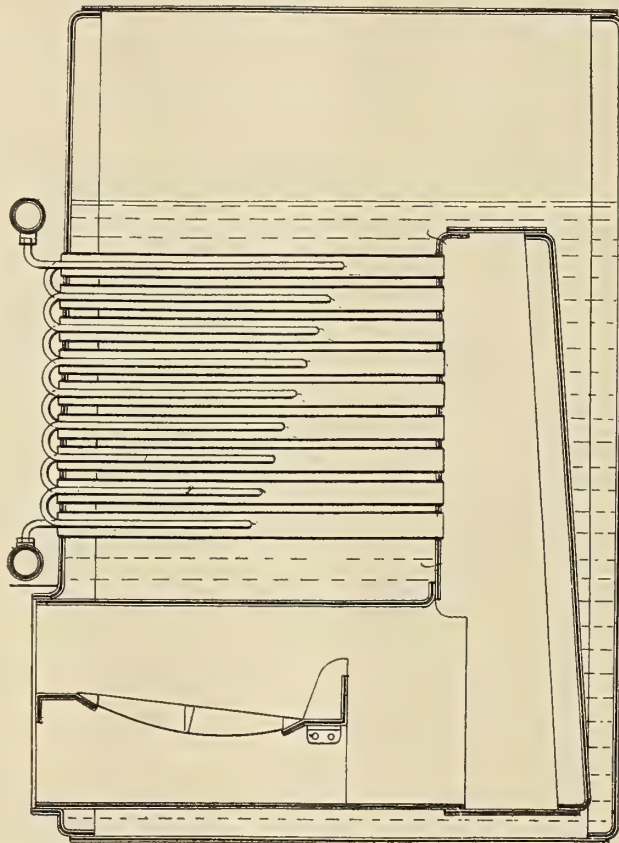
In order to secure a uniform speed for electrical motors used in driving these sirens, the lever, by which such a siren is opened or closed, also simultaneously makes or breaks, respectively, an electrical contact in the motor circuit so that the current, when the siren is closed, traverses a resistance equivalent to the load imposed by the siren when at work. By this arrangement the note pitch of the siren is not affected by variations in speed.

20,908. ASH EJECTORS. SOC. ANON DES. ETAB. DELAUNAY-BELLEVILLE, ST. DENIS.

This apparatus is characterized by an archimedean screw which rotates at a slow, uniform speed and receives from a hopper, located above, the cinders and clinker, and conveys them to the neck of an ejection nozzle supplied with water by a pump at high pressure.

13,317. SUPERHEATERS FOR MARINE BOILERS. O. E. JØRGENSEN, COPENHAGEN.

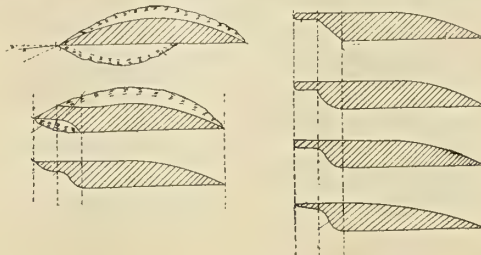
With smoke-tube superheaters it has been found that the lower row of smoke-tubes is easily choked, thus impeding the draught and rendering these superheating elements ineffective. By this invention this draw-



back is alleviated in that the obstruction in the lowermost smoke-tubes, by the superheating elements, is relatively decreased by making the length of the superheating tubes (the long U-shaped tubes) different, and arranging the shortest in the lowermost and the longest in the uppermost smoke-tubes.

28,894. SCREW PROPELLERS. W. H. WHITE, K. C. B., FROM D. W. TAYLOR, NAVAL CONSTRUCTOR, U. S. NAVY.

In order to minimize the harmful effect of cavitation on the efficiency of high-speed propellers, this invention consists in giving the following portion of the blade face a setback with reference to the leading portion, so reducing the area of the blade face covered by cavities generated by the action of the leading portion. The formation of cavities over the



back is helpful to efficiency, but if the speed of the leading edge of the blades becomes so great that cavities extend over a large proportion of the blade face the efficiency of the propeller is reduced. The first figure shows the effect of cavitation on the ordinary blade, and the second figure, the new shape and its cavitation. The others are modified forms.

26,036. CONSTRUCTION OF SHIPS AND DESIGN. A. E. BERESFORD, GOOLE.

Relates to an alteration in the form of ships' bottoms. These are corrugated fore and aft. This construction affords greater longitudinal strength than plating not corrugated. The floors, cut to suit, have a firmer foundation and cannot "trip." Intercostals and longitudinal girders between floors are obviated. The corrugations act as wash plates and retard the force of water-ballast transversely in double bottom steamers. Among other advantages, the reduction of rolling is claimed.